

Streetscape Challenges and Strategies for Improved Liveability in Bishoftu Town: the case of Dukem Sub city



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A Thesis Submitted to

The department of Architecture

School of Civil Engineering and Architecture

Presented in Partial Fulfillment of the Requirement for Master of Science degree in Urban
Planning and Design

Office of Graduate Studies

Adama Science and Technology University

January, 2024

Adama, Ethiopia

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Declaration

I hereby declare that this Master Thesis entitled “**Streetscape Challenges and Strategies for Improved Liveability in Bishoftu Town: the case of Dukem Sub city**” is my original work. That is, it has not been submitted for the award of any academic degree, diploma, or certificate in any other university. All sources of materials that are used for this thesis have been accordingly acknowledged through citation.

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Recommendation

I, the Advisor of this thesis, hereby certify that I have read the revised version of the thesis entitled **“Streetscape Challenges and Strategies for Improved Liveability in Bishoftu Town: the case of Dukem Sub city”** prepared under my guidance by **Tesfaye Tariku** and submitted in partial fulfillment of the requirements for the degree of Masters of Science in **Urban Planning and Design**. Therefore, I recommend the submission of the revised version of the thesis to the department following the applicable procedures.

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I, the advisors of the thesis entitled “**Streetscape Challenges and Strategies for Improved Liveability in Bishoftu Town: the case of Dukem Sub city**” and developed by **Tesfaye Tariku**, hereby certify that the recommendation and suggestions made by the board of examiners are appropriately incorporated into the final version of the thesis.

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We, the undersigned, members of the Board of Examiners of the thesis by **Tesfaye Tariku**, have read and evaluated the thesis entitled “**Streetscape Challenges and Strategies for Improved Liveability in Bishoftu Town: the case of Dukem Sub city**” and examined the candidate during the open defense. This is, therefore, to certify that the thesis is accepted for partial fulfillment of the requirement of the degree of Master of Science in Urban Planning and Design.

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ACKNOWLEDGEMENT

First and foremost, I would like to thank the Almighty God for His generosity throughout my work to complete the study successfully. Next, I would like to express my sincere and deepest gratitude to my supervisor Dr. Yared Girma for his unreserved support, evaluation, comments, encouragement, and guidance at various stages of the study. I really appreciate his patience and candid dedication towards the betterment of this research paper.

To my family and friends, words cannot convey how deeply grateful I am for your unconditional love and support. Your constant encouragement, understanding, and faith in my abilities have sustained me through the time of my research.

Furthermore, I would like to extend my gratitude to everyone who has been a part of this research, who offered their support, encouragement, and assistance along the way. Without them, this paper would not have been possible.

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LIST OF ACRONYMS

CBD: Commercial business district

EIZ: Eastern Industry Zone

ISOCARP: International Society of City and Regional Planners,

NGO: Nongovernmental Organization

OUPI: Oromia Urban Planning Institute

SDG: Sustainable Development Goals

SPSS: Statistically Package for Social Science Software

UN: United Nation

WHO: World Health Organization

ABSTRACT

Urban streetscapes play a pivotal role in shaping the livability and quality of life for residents, with their design influencing pedestrian safety, vehicular traffic flow, and overall environmental quality. This study focuses on the streetscape challenges along the stretch from Addis Kera Asphalt Road up to East Industry Zone Street in Dukem Sub-city. Through a multi-perspective approach incorporating detailed observations, key informant interviews, and pedestrian surveys, this research addresses critical concerns impacting pedestrian safety, vehicular traffic, land use, and overall urban quality. In this study, both quantitative and qualitative methods were used to achieve the intended objectives. The findings reveal glaring inadequacies in pedestrian infrastructure, particularly the absence of shade trees, with 96% of respondents expressing dissatisfaction. Inadequate street lighting poses safety risks, as 75% of survey participants feel unsafe walking at night. Sidewalk conditions are compromised by various obstacles, hindering accessibility, especially for those with disabilities. The absence of basic street amenities and furniture further diminishes the overall streetscape quality, as highlighted by an 83.4% dissatisfaction rate among respondents. Incompatibility with diverse users, including the elderly, disabled individuals, bicyclists, and street vendors, is a pervasive challenge, with 93.3% of respondents deeming the existing sidewalk unsuitable. Congested and uncomfortable vehicular traffic compounds the urban challenges, with on-street parking significantly reducing road capacity and causing delays. Unplanned and incompatible land use, marked by encroachment from commercial activities and informal vending, creates hazards for pedestrians and diminishes the usability of public spaces. The impact of these streetscape challenges on the livability and quality of life for Dukem Sub-city residents is profound. Survey respondents identified key consequences, including compromised pedestrian safety and comfort, increased traffic congestion and accidents, limited physical activity, restricted accessibility and mobility, lack of green spaces, diminished community interaction and social cohesion, and heightened noise and air pollution. Addressing these challenges requires a comprehensive urban planning approach that considers the diverse needs of residents. This study emphasizes the urgent need for interventions to enhance the streetscape, making it safer, more accessible, and conducive to a vibrant and connected community. The findings contribute valuable insights for policymakers, urban planners, and researchers aiming to create inclusive, sustainable, and aesthetically pleasing urban environments.

Keywords: Streetscape, Dukem, Urban livability, Street, Pedestrian, Urban design

CHAPTER ONE: INTRODUCTION

1.1. Background of the Study

The 21st century is witnessing a dramatic shift towards urban living. Cities are now home to over half of the world's population, and this trend is projected to continue (UN-Habitat, 2018). Cities play a crucial role in human well-being and economic development. However, rapid urbanization often leads to challenges like poor air quality, inadequate public spaces, and congested streetscapes. These factors can significantly compromise urban liveability, defined as the quality of life experienced in urban environments (Bai, 2010).

Urban liveability is a crucial concept in contemporary urban planning, encompassing the quality of life experienced by residents within a city's environment. Streetscapes, as the public spaces that pedestrians and residents interact with daily, play a significant role in shaping this liveability. Streetscapes are not simply the arteries of a city; they are, as Gordon Cullen so aptly captured, the "outdoor room" we inhabit (Ma, et.al. 2021). Every crossing, every turn, every glimpse from our doorstep reveals a microcosm of urban life, shaping our experience of the city beyond the confines of our walls. Beyond their physical manifestation, streetscapes are the most diverse and ubiquitous public spaces we encounter. Unlike confined parks or designated squares, they weave through every corner of the city, serving as the stage for countless daily interactions, informal gatherings, and spontaneous moments of community (Park et al. 2019). As David Harvey reminds us, these spaces represent "the very stuff of everyday life" (Harvey, 2014), playing a crucial role in fostering social engagement, promoting physical activity, and shaping our mental and emotional well-being (Park et al., 2019).

Global trends and standards for designing and enhancing streetscapes, with a focus on promoting livability, sustainability, and safety, emphasize key principles such as pedestrian-friendly environments, green infrastructure integration, and prioritization of active transportation modes. Complete Streets, as advocated by the National Complete Streets Coalition (2021), aims to accommodate all users by considering factors like sidewalks, bike lanes, crosswalks, and public transportation amenities. Vision Zero, a global initiative (Vision Zero Network, 2021), focuses on designing streets with the goal of zero traffic fatalities and severe injuries through measures like traffic calming and improved signage. Tactical Urbanism, as described by Lydon and Garcia

(2015), involves temporary, low-cost interventions to transform streetscapes and public spaces, encouraging communities to experiment with vibrant pilot projects. Green Infrastructure, as outlined by the European Commission (2015), involves integrating natural elements to promote sustainability and improve ecological benefits, air quality, and community well-being. These global principles highlight the shift towards streetscape designs that prioritize pedestrians, sustainability, and safety.

Well-designed streetscapes can foster social interaction, promote physical and mental well-being, and contribute to a vibrant urban economy (Gehl, 2010; Beatley, 2011). Studies like those by Gehl (2010) and Gehl and Svarre (2013) highlight the positive correlation between well-designed streetscapes and increased pedestrian activity, social interaction, and overall well-being. Conversely, poorly designed streetscapes can lead to traffic congestion, safety concerns, and a decline in quality of life, as evidenced by research from Appleyard (1979) and Hillier and Hanson (1984). The World Health Organization (2016) highlights the importance of accessible and well-designed streets for promoting physical activity, fostering social interaction, and reducing air pollution – all key contributors to urban health and well-being. Sadly, many cities particularly in developing countries, continue to struggle with poorly maintained pedestrian infrastructure, lack of green spaces, and limited opportunities for social connection, compromising the liveability of their streetscapes.

The rapid urbanization of African cities has underscored their susceptibility to shortcomings in streetscape design and management (UN-Habitat, 2016). Common challenges arising from this urban growth include the following: Firstly, limited pedestrian infrastructure characterized by narrow sidewalks, insufficient crosswalks, and a lack of accessible routes for individuals with disabilities, has the potential to discourage walking and hinder the promotion of active lifestyles (Koffi et al., 2019). Secondly, the dominance of motorized vehicles often takes precedence over pedestrian needs, resulting in unsafe and unpleasant conditions, which can impede social interaction and community cohesion (World Health Organization, 2018). Thirdly, the scarcity of green spaces and public amenities poses a considerable challenge, as inadequate access to parks, plazas, and green areas may adversely impact mental and physical health, limiting recreational opportunities and diminishing urban biodiversity (Agyemang, 2013). Lastly, issues of poor maintenance and management, manifested through deteriorated streetscapes, cleanliness concerns,

and inadequate lighting, contribute to a sense of insecurity and may discourage public utilization of urban spaces (Satterthwaite, 2008). These challenges collectively highlight the urgency of addressing streetscape deficiencies in African cities to foster more inclusive, vibrant, and sustainable urban environments.

Ethiopia, with its rich history and diverse urban landscapes, is no exception. The town of Bishoftu, situated in the scenic Ethiopian highlands, has seen rapid development in recent years, fueled by its proximity to the capital Addis Ababa and its growing popularity as a tourist destination. However, this growth has also brought challenges to Bishoftu's streetscapes, raising concerns about pedestrian safety, accessibility, and the overall liveability of the town. Focusing specifically on Dukem Sub City within Bishoftu Town, we find a microcosm of these challenges.

Understanding and analyzing the streetscape challenges in Dukem Sub-city is of paramount importance as it allows for the identification of specific strategies and interventions to improve the livability of the area. By addressing these challenges, the overall urban environment can be enhanced, making Dukem an attractive and sustainable place to live, work, and play. Therefore, this research aims to comprehensively investigate and analyze the streetscape challenges of Dukem Sub-city in Bishoftu Town. By examining the existing conditions, gathering data through various research methods, and engaging stakeholders, the study seeks to identify and suggest strategies for improved livability in the area. The findings of this research will contribute to the body of knowledge on urban planning and design, specifically in the Ethiopian context, and serve as a valuable resource for urban planners, policymakers, and community members involved in enhancing the urban environment.

1.2. Statement of the problem

Lack of consideration to sustainable designs of streetscape and public spaces in an urban environment can affect the mode of transportation, the functional and the visual image of the cities, social cohesions and way of community's life.

Bishoftu Town, specifically the Dukem Sub-city, is confronted with critical challenges related to its streetscape that significantly impact the overall liveability of the urban environment. The problem at hand stems from several interconnected issues that must be addressed for the town to flourish as a sustainable and people-centric community.

The streetscape in Dukem Sub-city is characterized by limited pedestrian infrastructure, a dominance of car-centric design, insufficient green spaces, and a lack of adequate maintenance. These factors collectively hinder the seamless flow of pedestrian activities, compromise safety, lead to parking problems (Street Side and public), traffic accidents, pollutions, poor urban waste management systems, high maintenance cost for infrastructure and utilities and contribute to an unattractive and unsustainable urban environment.

Statistics and observations reveal a glaring disparity between the demand for pedestrian-friendly streets and the existing inadequacies in Dukem Sub-city's streetscape. This discrepancy results in reduced walkability, increased vehicular congestion, and a lack of communal spaces for social interaction. As urbanization in Dukem Sub-city's accelerates, addressing these challenges becomes imperative for fostering a liveable and sustainable urban environment (Quezon, & Kumala, 2018).

Research on streetscape design and liveability is extensive globally (Istrate, & Chen, 2022; Ibrahim, 2023; Mohamad, & Hatipoğlu, 2023), its application in the Ethiopian context is relatively nascent. While some studies have been conducted in the broader areas of urban planning and transportation in urban center of Ethiopia (Nuriye, 2014; Atsbeha, et.al., 2017, Assen, & Quezon, 2019; Hagos, & Adnan, 2020; Teklemariam, & Shen, 2020), there is a gap in specific research that focuses on analyzing and addressing the streetscape challenges within the context of Bishoftu Town, specifically the Dukem Sub city. Previous studies have touched upon aspects of urban livability or transportation, but none have concentrated on exploring the streetscape challenges and proposing strategies for improved livability in this specific area. Thus, there is a need to undertake

a comprehensive analysis of the streetscape challenges in Dukem Sub city and identify strategies that can enhance livability. This research aims to fill the existing gap by providing a detailed investigation into the unique issues faced in Dukem Sub city and proposing context-specific strategies that can effectively address the streetscape challenges.

1.3. Objectives of the Study

1.3.1. General Objective

The general objective of this study is to investigate streetscape challenges in Dukem Sub-city, Bishoftu Town, and develop effective strategies for enhancing overall livability within the urban environment.

1.3.2. Specific Objectives

The specific objectives of the study are: -

- ◆ To assess current streetscape conditions in the study area
- ◆ To identify specific streetscape challenges that directly influence the livability of the urban environment.
- ◆ To assess the impact streetscape challenges on the livability and quality of life of residents in the study area
- ◆ To develop context-specific strategies for improving the streetscapes in Dukem Sub City

1.4. Research Questions

In light of the above problem statement and objectives, the study has the following questions.

- ◆ What are the current streetscape conditions in Dukem Sub city of Bishoftu Town?
- ◆ What are the specific streetscape challenges in Dukem Sub city that directly influence the livability of the urban environment?
- ◆ How do these streetscape challenges impact the livability and quality of life of residents in Dukem Sub city?
- ◆ What are the context-specific strategies that can be developed to improve the streetscapes in Dukem Sub city?

1.5. Significance of the Study

The theoretical significance of this study will lie in contributing to the broader understanding of urban livability, particularly within the context of streetscape challenges. By investigating and analyzing the streetscape dynamics in Dukem Sub-city, the study will seek to advance theoretical frameworks related to urban design, streetscape planning, and their direct influence on the overall livability of urban environments. The findings will offer theoretical insights into the specific challenges faced by streetscapes and will contribute to the development of a conceptual framework for formulating effective strategies that enhance urban livability.

From a practical perspective, this study will hold significant implications for urban planners, policymakers, and local authorities involved in streetscape design and urban development. The assessment of current streetscape conditions, identification of specific challenges, and the development of context-specific strategies will offer practical guidance for implementing targeted interventions in Dukem Sub-city. The study's outcomes can serve as a practical toolkit for decision-makers, enabling them to address existing challenges, prioritize improvements, and enhance the overall livability of the urban environment in a tangible and actionable manner.

Academically, this study will contribute to the existing body of knowledge on streetscape challenges and urban livability. The assessment of current conditions, identification of challenges, and the development of strategies will add valuable empirical data to the academic discourse on urban studies, environmental design, and urban planning. Researchers and scholars will be able to leverage the findings to expand their understanding of streetscape dynamics in rapidly urbanizing contexts, thereby enriching academic discussions and informing future research endeavors in similar urban settings. Additionally, the study will serve as a reference for academic courses and urban planning curricula, providing real-world examples and insights for students studying urban design and related disciplines.

1.6. Scope of the study

The thesis scope encompassed spatial and thematic dimensions. The study focused on investigating streetscape challenges within Dukem Sub-city, Bishoftu Town, with a thematic emphasis on urban livability. Themes explored included the assessment of current streetscape conditions,

identification of specific challenges influencing livability, evaluation of the impact of these challenges on residents' quality of life, and the development of context-specific strategies for improvement.

The spatial scope encompassed Dukem Sub-city within the broader context of Bishoftu Town. The study delved into the specific streets, neighborhoods, and public spaces that constituted the urban fabric of Dukem Sub-city. By focusing on this spatial context, the research aimed to provide detailed insights into the unique streetscape challenges within the designated area, ensuring that the formulated strategies were tailored to the local urban environment and its residents.

1.7. Limitation the Study

All research studies face limitations throughout their lifecycle. This study also had some limitations during its conduct. The first limitation was a lack of secondary data sources, specifically the inefficient provision of information by the urban municipality. In addition, the researcher faced some other challenges related to respondent behavior during interviews and questionnaire completion. These challenges included respondents failing to answer questions fully and correctly, and not attending focus group discussions when invited.

1.8. Operational Definition

- ◆ **Streetscape:** Streetscape refers to the visual and functional elements that comprise the outdoor environment of streets and public spaces in a specific urban area. These elements include but are not limited to sidewalks, roadways, street furniture, lighting, greenery, signage, and the overall aesthetic character.
- ◆ **Livability:** Livability is a multidimensional concept that encompasses the quality of life and well-being of residents within a particular urban environment. It is operationally defined by factors such as access to amenities, safety, environmental quality, social interactions, cultural richness, and the overall comfort and satisfaction experienced by individuals living in the community.
- ◆ **Urban Environment:** The urban environment refers to the collective physical, social, and cultural attributes of a specific area characterized by human habitation and

infrastructure. Operationally, it includes built structures, public spaces, transportation systems, natural elements, and the social dynamics that contribute to the unique character and functionality of the urban setting.

- ◆ **Streetscape Challenges:** Streetscape challenges denote specific obstacles and deficiencies within the outdoor environment of streets and public spaces that hinder their optimal functionality and aesthetic appeal. Operationally, these challenges encompass issues related to pedestrian infrastructure, traffic flow, green spaces, maintenance practices, and any other factors that negatively impact the overall quality of the streetscape.
- ◆ **Quality of Life of Residents:** The quality of life of residents refers to the subjective and objective measures that determine the overall well-being and satisfaction of individuals living in a particular urban area. Operationally, it encompasses factors such as housing conditions, access to healthcare and education, economic opportunities, safety, social connections, and the overall perceived happiness and fulfillment of residents in their daily lives.

1.9. Organization of the Research

This research is divided into five chapters. The first chapter is introduction, which includes the background of the study, statement of the problem, research questions and objectives, scope of the study, significance of the study, limitation of the study and organization of the paper.

The second chapter examines review of related literature that focuses on the basic concepts of urban livability, streetscape design, Streetscape Challenges, positive and adverse effects of urban streetscape on the built environment, and strategies for improving streetscapes. Furthermore, it reviewed empirical literatures related with the topic including the research gap and conceptual framework of the study.

The third chapter briefly presents description of the research design and methodology used in the study while the fourth chapter contains data analysis, presentation, and interpretation (research result and discussion). The fifth chapter is conclusion, recommendation, and direction for future research.

CHAPTER TWO: REVIEW OF LITERATURES

2.1 Introduction

This literature part incorporates theoretical and empirical works of literature associated with the issue under study. The study deals with the importance of streetscape in enhancing urban livability and important pieces of literature have been reviewed. Taking the research questions as a base and consideration, this literature reviewed the definition of the general study area, basics of street and streetscape concept, livability, street livability, and urban livability in general planning principles and guidelines for streetscapes, urban livability has been reviewed and two empirical reviews were analyzed.

2.2. Theoretical literature review

In this section, the study explored facts and theories that help the issue under the study area reviewed and presented underneath.

2.2.1 The basics of street and streetscape

2.2.1.1 Streets

The word the street has its origin in the Latin Strata, which means ‘paved road’. According to the Merriam Webster Dictionary (2020), a street is a thoroughfare, especially in a city, town, or village that is wider than an alley or lane and usually includes sidewalks A street is a public route in a city, town, or town that usually has residences and structures on one or both sides (Al Odat & Al Kurdi, 2021).

According to (Meht, 2006) Streets play an essential function in open public space and have become the most influenced emblems of the public domain. People's functional, social, and recreational requirements have been linked to economic progress, physical health, and communal sensibilities on the streets. Researchers propose that the street be viewed as a social place rather than just a means of transportation. Streets, in the form of highways, pathways, and public spaces, are essential to everyone's urban existence. Because of their tiny residences and absence of private gardens, people require the flexibility to wander or remain on the streets or public places. As a result, urban space as represented by squares and streets is seen as an important component of city

social life. Many towns throughout the world are now converting their roadways into more pedestrian-friendly public spaces (Tolley, 2003; Mehta & Bosson, 2018)

As (Burton & Mitchell , 2006; Hillman, 1990) stated that a street is an important urban area that is a constituent part of the city's spatial structure. Cities' streets also serve as structural components for the city. The nature of a city's main streets typically contributes to its character and individuality. As a result, they must perform complicated duties. They must have an identity and provide orientation in the city; as a result, their linkages to other major routes and sections of the city must be obvious.

2.2.1.2 Streetscapes

Streetscape, as a definition from the Oxford Dictionary is a view or scene of streets, it is the visual elements of a street, including the road, adjoining buildings, sidewalks, street furniture, trees, open spaces, etc., that combine to form the street's character, (Oxford Dictionary, 2020)

Urban streets may be thought of as a combination of two major components: roads and streetscapes. Main roads are infrastructure for linear movement, mostly by motor vehicles but also by non-motorized users such as walkers and bicycles. They are designed to be useful to provide safe and efficient transport (Charlwood, 2004). Streetscapes are the three- dimensional outdoor spaces surrounding roadways, outlined on either side by buildings that form streetscape skeletons (Harvey, Aultman-Hall, Troy, & Hurley, 2017). Generally, plans of streetscapes are affected by a wide extent of plan subtle elements such as building materials, structural styling, plantings, and road furniture, but urban plan scholars for the most part respect the essential extents and scale of streetscape skeletons as imperative to consolation and social efficiency for human users. In any case, planners regularly assign roads in terms of thruway plans for motor vehicles based on useful classifications such as arterial, collector, and neighborhood.

The aesthetic aspects of a street that combine to establish the street's character are referred to as the streetscape. It is one of the most essential things that contribute to the development of cities and tourist sites through its strategic function in guiding people's movements and boosting business and employment. Improving the streetscape may make the local environment more appealing,

healthy, fun, safe, and intriguing, as well as help to build more livable communities (Harvey & Aultman-Hall, 2016).

2.2.1.3. Street network

Street is the basic unit of urban space through which people experience the city (Boeing, 2019a). Street is more than just a linear path; it can express civic society, a cultural interface, and urban life substance. As a result, the street has become a focal point for human activity. The basis of urban accessibility is the establishment of city street networks and the movement patterns of people and products (Al-hinkawi et al., 2021).

Whether planned or unplanned, orderly or disordered, street networks organize and constrain a city's traffic dynamics according to spatial logic (Boeing, 2019a). Streets are the determinants of urban growth. A good design will act as a catalyst, but a bad design will freeze city life. The urban street network must be recognized to improve the coherence between the urban and its street system (Al-hinkawi et al., 2021).

Human spatial dynamics and flows in a city are organized and structured by street networks. The study of street networks has become a vital link between graph theory and urban morphology and planning. Cities can be aggregated and categorized based on the structural properties of their networks or cities' circulation networks have spatial characteristics that may be quantified and operationalized to distinguish between different sorts of locales (Boeing, 2019b).

2.2.2 Element of Streetscape

According to (Harvey, Aultman-Hall, Troy, & Hurley, 2017)) streetscape elements are all those functional and decorative elements that are placed, laid, erected, planted, or suspended within a public or communal urban space. They include public utilities and amenities, visible elements of service infrastructure, street lights, traffic signs and signals, street trees and other horticultural elements, general public furniture, advertising signs, and decorations. In a border sense, this visible element is also categorized as layout, surfacing, landscaping, public furniture, service infrastructure, and signage.

2.2.3 Aspects of a streetscape concerning Elements.

2.2.3.1 Legibility

Legibility in the context of urban planning and design refers to the degree to which a city is easily comprehensible and navigable for its residents and visitors, enabling seamless movement throughout its spaces. A legible city is characterized by a clear and intuitive layout, where important landmarks, destinations, and pathways are easily discernible, aiding wayfinding and navigation. The concept of legibility plays a crucial role in shaping the urban experience, as individuals rely on their ability to interpret and understand the urban environment for efficient and enjoyable movement within it (Al Odat & Al Kurdi, 2021)..

In legible cities, important places are designed and arranged in a way that naturally draws attention, making them stand out and facilitating easy identification. This design approach helps users create mental maps of the city, enhancing their spatial awareness and reducing the likelihood of disorientation (Al Odat & Al Kurdi, 2021). Landmarks, key intersections, and public spaces are strategically positioned to create a sense of hierarchy, allowing users to prioritize and distinguish between various locations (Charlwood, 2004).

2.2.3.2 Comfort and safety.

The concept of active and functional streetscapes emphasizes the importance of creating urban environments that cater to the diverse needs of all users, regardless of their mode of transportation. A comprehensive streetscape design considers the comfort and safety of various users, encompassing pedestrians, drivers, strollers, street cafés, street vendors, joggers, and more. This holistic approach aligns with the principles of inclusive urban design, recognizing that streets are not merely conduits for vehicular traffic but dynamic spaces where different activities converge. According to Charlwood (2004), an authority in urban design, streetscapes should be meticulously planned and furnished to accommodate the expectations of a wide array of users. For pedestrians, this may involve the incorporation of adequate sidewalks, shade trees, and amenities like benches, ensuring a comfortable and safe walking experience. Drivers benefit from well-designed roads and efficient traffic management systems, while strollers and joggers require accessible pathways and green spaces. Street cafés and vendors contribute to the vibrant street life, necessitating thoughtful planning for their integration into the urban fabric. In essence, an active and functional streetscape is a reflection of a city's commitment to fostering a diverse and inclusive community, where the

design goes beyond mere functionality and actively contributes to the quality of urban life. This perspective aligns with broader discussions in urban planning literature, emphasizing the role of streetscapes in creating vibrant, accessible, and socially engaging urban environments (Gehl, 2010; Jacobs, 1961; Lynch, 1960).

2.2.3.3 Attractiveness

Urban streetscapes play a pivotal role in shaping the visual identity of a city and significantly contribute to the overall aesthetic appeal of the urban environment. The concept of streetscape refers to the visual elements and design features present in the public realm, encompassing everything from street furniture and landscaping to lighting and architectural details. When strategically designed and aesthetically pleasing, the streetscape enhances the visual experience of residents and visitors alike. Achieving a visually attractive streetscape is not only a matter of subjective preference but is also rooted in established urban design principles. According to Mohammed (2013), for a city to aspire to national recognition, its streetscape and associated elements must adhere to the highest urban design standards. This implies that cities aiming for prominence should prioritize the incorporation of elements such as well-designed public spaces, cohesive architectural styles, and thoughtful landscaping into their streetscape. Such adherence to urban design standards not only elevates the city's visual character but also contributes to a sense of identity and pride among its inhabitants. Additionally, aesthetically pleasing streetscapes have been linked to positive impacts on residents' well-being and community cohesion (Gehl, 2010). Therefore, investing in high-quality streetscape design becomes not just an aesthetic choice but a strategic endeavor for cities seeking national recognition and striving to create vibrant, livable urban environments.

2.2.3.4 Liveliness

Streetscapes, encompassing the physical and visual elements of urban streets, play a crucial role in enhancing mobility and shaping the overall livability of urban corridors. When thoughtfully designed, streets transcend their conventional function as mere conduits for vehicular traffic and transform into vibrant, multifunctional living spaces. This paradigm shift emphasizes the importance of streets as communal areas where people engage in social interactions, fostering a sense of community and connectivity. Streetscapes should be envisioned as places where individuals can both observe and be observed, promoting a dynamic urban environment that caters

to diverse needs and activities. This approach aligns with the principles of creating "living streets" as advocated by urban theorist David Harvey (2014), emphasizing the human-centric nature of urban design. The International Society of City and Regional Planners (ISOCARP, 2010) also recognizes the significance of streetscapes in shaping the social fabric of cities. The social life of a city should extend beyond formal institutions, and the vitality of its streets contributes significantly to the city's image and appeal to both residents and visitors. In essence, streetscapes serve as the canvas upon which the social life of a city unfolds, influencing perceptions of urban identity and contributing to the overall vibrancy of the urban experience.

2.2.4 Livability and streetscape

Various definitions of livability exist, all of which are primarily concerned with the "quality of life" issue. In the same way that sustainability is an abstract concept in urban planning, livability is. As a result, an array of design principles and guidelines should be identified, and the quality of urban design should be improved, using the term in the urban design field. Livability is strongly linked to people spending as much time as possible on the streets, engaging in various activities such as walking, sitting, dining, biking, playing, shopping, and so on (Anderson & Ellis, 2014).

Factors such as connectivity and accessibility to a variety of services and uses, as well as safety, attractiveness, and a sense of place, all contribute to co-presence. Apart from these factors that encourage a large number of people to attend, equal access to all people, regardless of age or mobility impairments, people with strollers, elderly, children, and injured) is a high priority for achieving livability. In another way, the importance of people living and using the streets' perceptions of livability.

In this sense, livability is a two-way street, with safety increasing the perception of livability and livability in the sense of liveliness, and 24/7 street use contributing to the sense of safety (Stavroulaki & Meta, 2020).

2.2.4.1 Livable streets

A livable street, also known as a living street, is a street concept that, in contrast to traditional urban street concepts, prioritizes pedestrians and cyclists, allowing the street to be used equally by all. The concept of a livable street was first introduced in the Netherlands, as a road with traffic-

control devices installed to reduce or slow traffic flow (Bosselmann, Macdonald, & Kronmeyer, 1999).

The focus of Livable Street is on safety and comfort. The street should encourage the people to use the public space on the street, as well as give them the freedom to change the space's functions and reform it to suit their needs and inventiveness (Stavroulaki & Meta, 2020).

Livable streets in urban neighborhoods can be great places for public life and social inclusion (Sauter & Huettenmoser, 2008). To create a livable street, another important social factor for designers and engineers is that a street shall be a comfortable setting where people of different ages knowledge and other groups can learn and perceive the nature and social connections in the neighborhood (Francis, 2016).

The development of a livable street concept necessitates the cooperation and participation of all stakeholders. Organizations can lead to fewer conflicts if they strike a balance between the interests of various groups, which could speed up the implementation process. In practice, livable street policies may not always be recognized as a better all-around solution. Several studies look at the challenges of implementing local government policies (Dodson et al., 2014).

2.2.5 Benefits of Streetscape

2.2.5.1 Economic Development

An aesthetically pleasing and well-designed streetscape plays a crucial role in fostering economic development within urban areas. A visually attractive town center not only draws in new residents and visitors but also attracts business owners, leading to increased economic activity (Cuthbert, 2003). The creation of inviting public spaces, such as retail shops and street markets, contributes to the local economy by providing job opportunities for residents and encouraging entrepreneurship (Cuthbert, 2003). This economic vibrancy, in turn, enhances the overall prosperity and sustainability of the community.

2.2.5.2 Healthy Communities

A well-designed streetscape promotes the health of communities by fostering social interaction and creating safe spaces for pedestrians and cyclists. When streets are designed with the well-being of citizens in mind, they become more than just conduits for traffic—they transform into places

where people can walk, bike, and engage with each other (Almirall Esteve, 2016). This emphasis on healthy mobility options and social connectivity contributes to the overall physical and mental well-being of community members, creating a more livable and vibrant urban environment.

2.2.5.3 Pollution Reduction

Green elements within the streetscape, such as trees, greenery, and parks, play a vital role in reducing pollution. These elements act as natural filters, absorbing air and water pollutants and improving air quality (Nowak and Dwyer, 2007). Additionally, the presence of green spaces provides shade and contributes to a cooling effect in public spaces and buildings, mitigating the urban heat island effect. This dual benefit of pollution reduction and environmental cooling enhances the overall environmental quality of the urban setting.

2.2.5.3 Traffic Calming

An intelligently designed streetscape incorporates elements that contribute to traffic calming, making urban environments safer and more pedestrian-friendly. Street furniture, raised crosswalks, and other features of the pedestrian landscape serve to slow down vehicular traffic and increase driver awareness of their surroundings (Hass-Klau, 1990). This not only enhances the safety of pedestrians and cyclists but also contributes to the creation of a more comfortable and enjoyable urban experience for all residents.

In summary, a well-conceived streetscape offers a multitude of benefits, ranging from economic development and the promotion of healthy communities to pollution reduction and effective traffic calming. These advantages collectively contribute to the creation of vibrant, sustainable, and people-centric urban environments.

2.2.6. Challenges of streetscape design

Many factors affect streetscape design as well as the capacity of the street. The followings are among them: lane width, lane number, design speed, on-street parking, driver population, surface condition, control condition at the intersection, median type, concrete barriers, urban bus transport, incidents, etc. (Maaty, 2018).

According to (Kienitz, n.d.), Transportation networks, health and safety, the environment, and economies all benefit from Complete Streets legislation. However, converting roads to Complete Streets can be difficult. Here are eight common Complete Streets challenges and solutions for your town to consider. Land uses and street design are intricately related. Naturally, when planning and constructing your streets, you must take into account the existing and projected land uses that influence your corridor. This can be challenging, especially if your corridor is long and allows a variety of land uses. While automobiles have historically been \ given priority in the construction of many streets and corridors, many people do not have access to or the capacity to drive. Furthermore, many smaller towns do not have adequate public transportation to serve their population. Any community's livelihood and well-being are dependent on easy access to reliable transportation. It's especially critical for underrepresented groups like persons traveling in low-income neighborhoods, people of color, and the elderly. Our streets are defined as a shared public place under the Complete Streets principles. Streets serve as more than just a means of transportation; they also act as outdoor rooms for our communities. Many streets, however, lack the aesthetic appeal and traffic buffer needed to attract and serve a wider range of users after decades of focusing on the flow of cars.

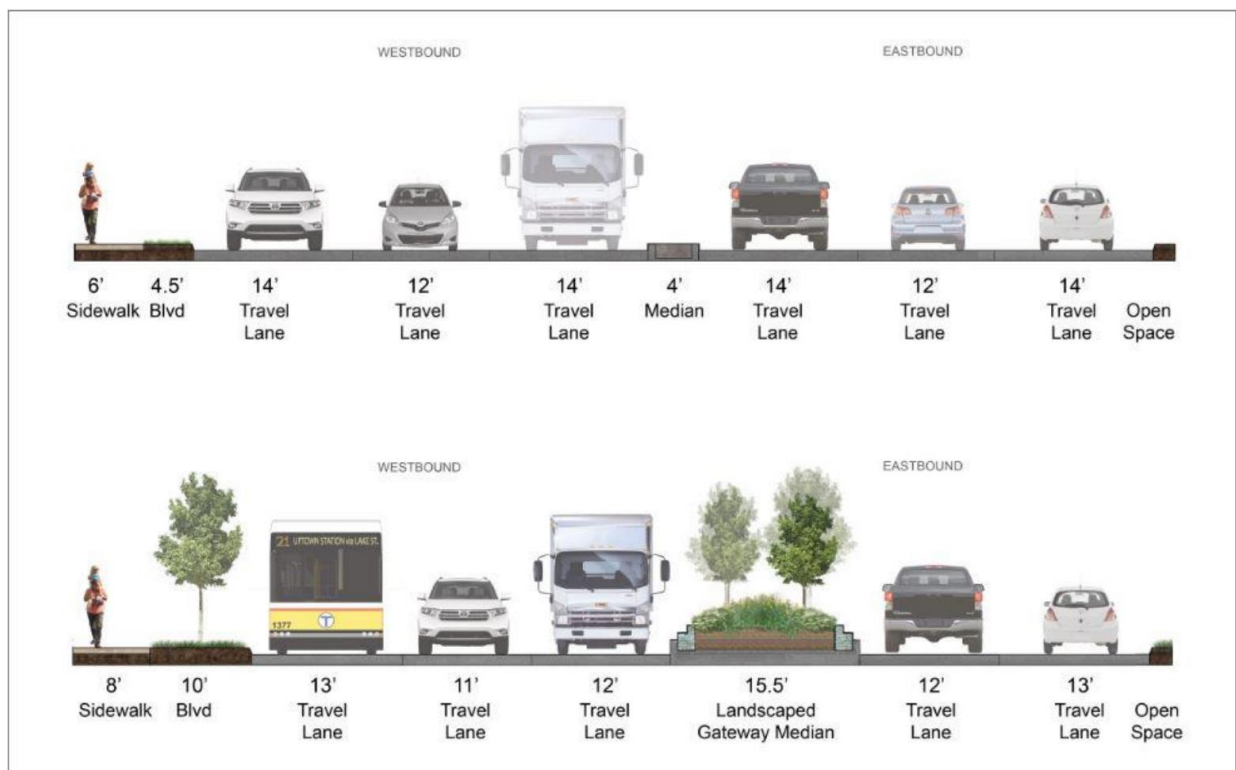


Figure 1:- Complete streetscape

According to (Kienitz, n.d.), It should be quick, safe, and simple to cross the street. Multiple turn lanes or channelized free-flowing lanes may be present at crossroads with significant turning volumes. These lanes increase the crossing distance and exposure to motor traffic for pedestrians. To make room for all users, facilities and signalization that were previously geared to keep motorists going must occasionally be changed. Signal timing, lane width, and the n number of lanes are all significant considerations for Complete Streets initiatives, especially when traffic congestion is an issue. There's a reason why our main streets are so congested.

Important destinations and connections are included, often across a physical barrier such as a road or a body of water. They include important destinations and connections – sometimes over a physical barrier like a freeway or a body of water. Making room for bicyclists on these roads can be difficult because most riders find riding alongside heavy traffic uncomfortable. To feel at ease, they require more room and safety.

According to (Kienitz, n.d.), There are a lot of moving parts in transit. There is bus traffic, passengers, loading zones, shelters, benches, signage, and more to consider in addition to local, express, and rapid transit alternatives. Many of our streets would be incomplete without public transportation. The presence of on-street parking is frequently influenced by the surrounding Land use. However, removing or reducing on-street parking as part of a project is typically seen as a burden by companies and property owners.

2.3 Empirical Literature Review

This section of the study related streetscapes with livability based on observed and measured phenomena that have been studied and implemented around the world and responded to specific research questions raised in this study, which helped to clarify the general concept of the streetscape.

2.3.1 Promoting Cultural identity along with Streetscape Redesign “Case studies in Cairo and Luxor Cities, Egypt (by Mohga E. Embaby)”

Mohga E. Embaby (2015) conducted a study which is entitled “Promoting Cultural identity along with Streetscape Redesign “Case studies in Cairo and Luxor Cities, Egypt”. Focuses on streetscape redesign principles by identifying the major intervention techniques to improve neighborhood character and identity along Cairo's main streets. The study's main goal is to examine urban planning concepts for preserving and developing a community's local identity, originality, and cultural assets along downtown main streets.

This study's method is based on a theoretical and practical approach. This aids in the analysis of ideas for streetscape redesign and cultural identity relationships, as well as the development of a practical framework for defining the major stages of the redesign process. And evaluating the outputs and results of two separate case studies of key streets in Egyptian cities, respectively. This research attempted to present theoretical principles for the development and revitalization of historic streets. When these principles are used, there are significant variances in the actual urban conditions on the street, therefore each of these principles has its significance and effectiveness. The study also identified an important issue: how to apply appropriate redesign principles to the cityscape based on its character. This study finds that streetscape redesign is critical for preserving and promoting historic cities' cultural identities.

2.3.2 Measuring Urban Streetscapes for Livability (Chester Harvey and Lisa Aultman- Hall)

Chester Harvey and Lisa Aultman-Hall (2016) conducted a review approach study on Measuring Urban Streetscapes for Livability by using Surveys and geographic information systems which are used as traditional qualitative approaches for collecting streetscape measures to measure urban streetscapes livability.

This research focused on a broad examination of streetscape livability, which will necessitate precise and efficient measurements of physical characteristics at the spatial scale of individual

streetscapes, as well as indicators of experiential quality based on revealed behavior or stated preferences.

Field audits are now the most common method for analyzing the mesoscale qualities of entire streetscape settings, as well as intricate microscale design components like architectural styling and materials, according to the study's findings. Although GIS approaches are popular for recording macroscale development patterns across entire neighborhoods or cities, exact geometric data for mesoscale items such as buildings and trees, which are crucial for defining streetscapes, has typically been lacking.

2.3.3. Sidewalk Standards in Addis Ababa

According to the Norms and Standards of the Addis Ababa structure plan outlined in May 2002, pedestrian sidewalks must be provided on both sides of arterial streets and should be raised 15-20 centimeters above the carriageway. The pedestrian capacity on a sidewalk should be a minimum of 30 and a maximum of 50 persons per minute per meter width after deducting approximately 0.9-meter dead width in shopping areas and 0.45 meters elsewhere. Pedestrian sidewalk width should be 2.5-4 meters on one side of a sub-arterial street and alongside a principal arterial; it should be 3.5-5 meters.

Table 1: Sidewalk standard used in Addis Ababa.

Type of street	Width (on both sides of the street in M)
Principal arterial	7-10m
Sub arterial	5-8m
Collector street	<2m
Local street	Should not be decided

Source: Norms and standards (2002)

2.3. 4. Pedestrian Norms and Standards (Local)

Pedestrian ways should be provided on both sides of Arterial Street. For Collector Street and local street provision, the location and size of pedestrian ways should be decided by local development plans, detailed plans, and other studies as applicable. Pedestrian ways should be raised 15-20 cm

above the carriageway. The average width of pedestrian walkways along sides of Arterial Street: In Industrial areas 1.8m, ii. Shopping frontages 3.7-4.5 m, iii. Business and commercial areas 3-5 m.

Table 2: Norm and standards for pedestrians

No.	Street Types	Average Width of Pedestrian Ways (M
1	Urban Motorway	No pedestrian ways
2	Sub-Arterials	2.5-4 m.
3	Principal Arterial	Should not be less than 3.5 m and a maximum of 5.
4	Collector Streets	Should not be less than 2 m.
5	Local Streets	Should be decided based on Local conditions

Source: Norms and standards 2002).

2.4 Gapes of literature review

In this study of literature reviews, a significant number of papers centers around just only beautification of streetscapes disregarding different issues those ventures are causing and affecting the wholeness of the streets. As a pattern as the study referenced before the majority of papers is not straightforwardly relate streetscapes with the livability concepts and city framework all the more regularly they concentrate on just identifying with perceived things, not those physiological and social well binges which affect the livability of the sub city.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Description of the Study Area

Dukem Sub-city is one of fast-growing town in Ethiopia with an estimated total population of 25,214. Dukem town is located 37 km to the south east of Addis Ababa next to the main road to Adama. Physically, Dukem spans an area of 9,630.6 hectares between latitudes 8°45'25" N and 8°50'30" N and longitudes 38°51'55" E and 38°56'5" E. Dukem is situated at 2,100 meters above mean Sea Level. Within the Oromia Regional State and Dukem is one of the reform towns of the region and has a city administration municipality and four kebeles, or neighborhood associations, which are the smallest unit of local government in Ethiopia. It is the administrative center of Akaki woreda that is defined by the third level administrative division of Ethiopia and is composed of a four kebeles. The areas have four kebeles namely Malka Dukem, Tadacha, Gogecha, and Dukem Koticha.

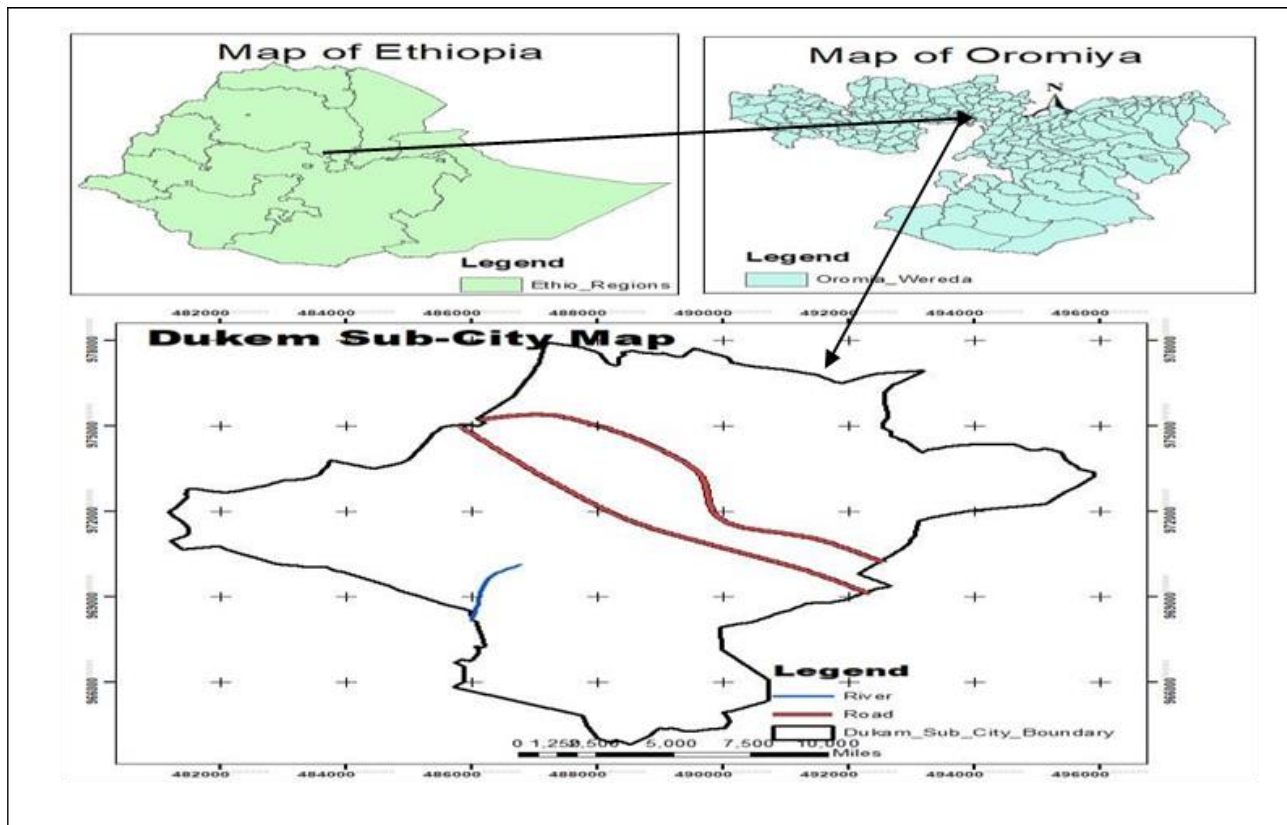


Figure 2:- Location Map of Dukem Sub-City

The elevation of Dukem sub-city ranges from 1890m to 2300m above MSL with an altitudinal range of 410 meters. The north eastern, northern and eastern parts of the town are generally characterized by rugged topography (OUPi, 2017). On the other hand, the southern and western parts of Dukem have monotonous flat topography. The elevated topography in the north eastern and northern parts of the town is responsible in determining the southwest flow direction of major perennial and seasonal streams. There is also flush water from Eastern Industry Zone (EIZ). The rugged topography in the northern and north eastern parts of Dukem town is inaccessible with stony landscape and steeper gradient that has impact on the infrastructure development (OUPi, 2017).

According to OUPi, (2017) the agro climatic relationship between altitude and temperature in Ethiopia indicates that the climate of Dukem town falls in the semi temperate agro-climatic zone with temperature range of 150C to 200C. On the other hand, the metrological station of Akaki which is located at a distance of 15kms is used to analyze the climate of Dukem town as shown in (Table 3).

Table 3: Climatic data of Dukem sub-city from 1997 to 2017

Elements	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
PPT(CM)	13	17	52	80	76	107	228	241	114	28	8	5
Temp	19	20	21	22	22	20	19	19	19	20	19	19

According to OUPi, (2017) the average annual rainfall of Dukem town and its surrounding is 800.3mm. The total average annual rainfall of Dukem town is 963mm. The seasonal distribution of rainfall in Dukem town indicates that the rainy season starts in spring and lasts up to the end of August. On the other hand, the driest season of the town is winter (December to February). The remaining seasons of the year (autumn and spring) are characterized by having moderate amount of rainfall that is below the amount of rainfall occurring during the summer season. Because of this, the growing period of Dukem town starts as early as spring season and lasts in autumn season. As it is shown by the rainfall and temperature graph of Dukem town, the highest temperature within the year occurs during the spring season of the northern hemisphere. In fact, the temperature

continuously rises from January to May with the maximum amount of temperature occurring in May.

3.2. Criteria for selecting the study area

The study selected Main Street which starts from the Addis Kera Asphalt road up to East Industry Zone which covers 3.5 Km, for the following reasons:

- **Exemplifying Streetscape Deficiencies:** This specific street showcases a concentrated manifestation of poor streetscape elements. Imagine potholes interrupting pedestrian flow, dilapidated sidewalks offering little safety, and inadequate street lighting compromising nighttime accessibility. The absence of greenery, street furniture, and public spaces further hinders livability. This confluence of problems makes this stretch an ideal microcosm for studying and addressing the broader challenges faced by Dukem Sub city's streetscapes.
- **Disrupted Street Connectivity:** This main street's role as a key artery connecting the Addis Kera road to the East Industry Zone is crucial. However, poor internal connectivity within the street itself, due to missing or obstructed pathways, hinders pedestrian and cyclist movement. Furthermore, inadequate public transportation integration isolates residents and diminishes accessibility for various destinations. This site presents a clear case study for exploring strategies to improve internal and external connectivity, promoting walkability and accessibility for all.
- **Accessibility for Diverse Users:** This street caters to a diverse range of users, including residents, commuters, industrial workers, and students. Addressing pedestrian safety, accessibility for differently-abled individuals, and the needs of street vendors are just some examples of the multifaceted perspectives this site offers.
- **Demonstrating Impact:** The chosen street's strategic location and visibility make it a prime candidate for implementing pilot interventions. Successfully improving livability here would have a ripple effect, potentially influencing broader urban planning and streetscape development strategies across Dukem Sub city. This aspect adds valuable practical significance to your research, showcasing the real-world application of your findings.



Figure 3:- Main Street of the study area (Addis Kera Asphalt road up to East Industry Zone)

In conclusion, the selected site is characterized by general streetscape elements in a deteriorated state and poor street connectivity and mobility. Through a thorough examination of these criteria, the study aims to uncover specific challenges and propose targeted strategies for enhancing the livability of the main street in Dukem Sub-City, Bishoftu Town.

3.3. Research Design

A research design is the ‘procedure for collecting, analyzing, interpreting and reporting data in research studies (Yu, 2009) it's the general plan for connecting the conceptual research problems with the pertinent (and achievable) inquiry. In other words, the research design sets the procedure for the specified data, the methods to be applied to gather and analyze this data, and the way all of this is often visiting to answer the research question (Wilkerson, 2014). A descriptive research design was employed for the study to research the situations thoroughly.

3.4. Research Approach

This research employed a mixed-method approach to investigate the existing condition and nature of streetscape problems in Dukem Sub city. Qualitative methods were used to explore the changing character of streets and streetscapes, focusing on the quality and experience of residents, particularly day-to-day users of the main street from Addis Kera Asphalt road up to East Industry Zone. This in-depth approach helped understand the extent of urban physical changes and existing streetscape conditions, including spatial characteristics and their impact on users. Field observations, open-ended questionnaires, and interviews with professionals and vehicular drivers provided rich qualitative data.

Quantitative methods were then used to investigate the measurable impact of these streetscape problems on livability. Attitudes, behaviors, and user perceptions were quantified through questionnaires and controlled observations, and statistical methods were employed to analyze the numerical data. This provided valuable insights into the extent and severity of the problems affecting residents and users.

3.5. Type and source of data

Both primary and secondary data sources were used in this research. Primary data was collected through original techniques such as field observations, questionnaires with frequent users of the Addis Kera Asphalt road up to East Industry Zone, and interviews with professionals like architects, urban designers, and planners. Vehicular driver interviews were also conducted.

Controlled site observations based on specific measurement techniques were utilized to analyze street character, including streetscape design aspects and urban design elements that significantly impact city livability. To analyze the existing conditions in detail, the study employed digital hand tallies, phone cameras, meters, and photography during site observations.

The prepared checklist categorized into four criteria based on established standards:

- General streetscape elements
- Street utilities and services relevant to pedestrian activities
- Street connectivity and mobility
- Existing urban fabric

Secondary data was collected from published and relevant reports, including journals, articles, and reports directly related to streetscapes and street elements. GIS data for the study area and maps were also used. Additionally, world-renowned best practices served as a secondary data source, providing empirical evidence for the research.

3.6. Sampling Techniques and Sample size

This research adopted random and purposive sampling techniques in this study. This sampling method is applied to Pedestrians, vehicular drivers, and experts (planners, architects, and urban designers). The sample size is drawn for pedestrians which are participated in the questioners. Cochran's formula (1963) had used to determine the sample size since the population size is unknown for street surveys.

$$n = \frac{z^2 pq}{e^2}$$

Where;

n_o = sample size

Z = confidence level at 95% (standard value is 1.96)

P = the estimated proportion of an attribute that is presented in a population with 50%

q = 1-p

e = designed level of precision with + 5%

This study used 95 % of confident level, Value of standard deviation is $p = 5$ and margin of error is $\pm 5\%$ and z score for 95 % confidence level is will be 1.96.

Therefore; -

$$n = (1.96)^2 \times 0.5 (1- 0.5) / (0.05)^2$$

$$= 9604/0.0025 = 384.16$$

A total of 384 questionnaires were printed and distributed for the purpose of collecting responses from 384 samples. The primary focus during this process was on pedestrians, who served as the

major sampling units. Pedestrians were chosen because of their direct and everyday interactions with the streets, making them highly exposed to and affected by the unconventional streets and streetscapes in the sub city. The survey questionnaire specifically targeted pedestrians who were present on the street at the time of data collection. Furthermore, semi-structured interviews played a crucial role in this study, facilitating direct interaction between vehicular users and professionals. A total of 35 vehicle drivers and 3 professionals were interviewed.

3.7. Data Collection Instruments

3.7.1. Questionnaires

The researcher used questionnaires to collect data from all respondents in the selected sample. The overarching goal of the questionnaire series was to gain a comprehensive understanding of the current challenges faced by pedestrians and to gather insights into the preferences of frequent street users for the future development of the Addis Kera Asphalt road up to East Industry Zone Street. The items on the questionnaires were originally prepared in English and then translated into Oromifa. The Oromifa questionnaires were then back-translated into English to ensure that the translation was accurate. The questionnaires contained both closed-ended and open-ended questions.

3.7.2. Key Informant Interview

Semi-structured interviews were used in the study to directly interact with vehicular driver and with professionals (urban planners) in the Dukem Sub city municipality. This data collection instrument was significant as it allowed for insights from vehicular drivers, who are integral to the street and streetscape, providing a deeper understanding of their perspectives on the current conditions. Additionally, professionals were consulted to obtain their expert opinions on the selected street and to gather strategic recommendations based on their professional expertise.

3.7.3. Focus Group Discussion

Focus groups discussions are a type of collective interview where the researcher encourages discussion among participants to generate rich data. Focus groups discussion typically consist of a researcher and two groups of 6-8 participants each. Focus groups are one of the most important techniques for gathering participants' opinions, attitudes, values, and expectations on a particular topic.

Focus groups were used in this study to collect data on the existing condition of the streetscape and how it affects the user. Two separate focus groups were held, each with 6-8 participants. Open-ended questions were asked to foster a positive environment for the focus groups and to focus on existing condition and challenges of streetscape.

3.7.4. Field Observation

The researcher observed the study area to collect data and verify the findings of the interviews. This was done through physical inspection, reconnaissance, sketches of problem areas, and photographs. The initial data collection approach was a direct and controlled observation, taking site photos and filling out prepared checklists in which the physical qualities and characters of the streets from Addis Kera Asphalt road up to East Industry Zone Street were assessed.

The checklists were created based on general elements of sidewalk elements, sidewalk width, sidewalk green elements, sidewalk sitting area, buffer zone, ditch, and all the existing street amenities. The checklists were used for two consecutive days. The current physical character of the streets was documented based on those approaches. This method was applied and used in this research to deeply understand the extent of the existing physical condition of streetscape. The following check list was used for the field observation:

Category	Elements	Condition (Available/ Less available /No)	Challenges
General Streetscape Elements			
	Sidewalks		
	Pavement		
	Street furniture (benches, lighting, etc.)		
	Trees and landscaping		
	Signage and wayfinding		
	Public art		
	Waste bins		
	Street lighting		
Street Utilities and Services			
	Drainage		
	Utility poles and wires		
	Waste collection		
	Public toilets		

Street Connectivity and Mobility			
	Pedestrian crossings		
	Traffic signals		
	Bicycle lanes		
	Public transport stops		
	Parking		
Existing Urban Fabric			
	Building condition		
	Land use mix		
	Building setbacks		
	Active frontages		

3.8. Data analysis and presentation

The analysis of data involved a combined approach of qualitative and quantitative methods. Quantitative methods were used to analyze data collected through questionnaires, revealing trends and patterns in user perceptions and attitudes towards the street and streetscape. Statistical analysis, presented in tables and graphs with percentages and numerical values, provided insights into the extent and severity of the identified problems.

Qualitative data, gathered through observations and interviews, was analyzed using in-depth methods to explore the specific experiences of users and their interactions with the street. Discussing and narrating the data, supported by images, tables, and maps, allowed for a nuanced understanding of the user's perspective and the lived experiences within the streetscape. Descriptive maps, tables, and pictures were particularly valuable in interpreting data from controlled site observations (using a checklist) and questionnaires, providing visual context to the findings.

To achieve a comprehensive analysis, the research utilized various software tools:

- SPSS and MS-Excel: Analyzed and generated accurate output from questionnaires.
- Ms. Word and phone recordings: Transcribed recorded interviews for qualitative analysis.
- Phone camera, Adobe Illustrator (AI), and Photoshop (PS): Illustrated and enhanced findings from site observations.

Ultimately, the analysis results, based on controlled observations, questionnaires, and interviews, were presented in a variety of formats:

- Text and photography: Described qualitative findings in detail.
- Narrative: Provided context and interpretation to the data.
- Graphs and tables: Visualized quantitative trends and patterns.
- Maps: Illustrated spatial relationships and distributions.
- Statistical analysis: Presented numerical data and significance levels.

This combination of qualitative and quantitative approaches, supported by diverse data analysis and presentation methods, ensured a rich and nuanced understanding of the streetscape challenges and user experiences in Dukem Sub city.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1 Introduction

Within this section, the study unveils and deliberates upon the findings of the research pertaining to Streetscape Challenges and Strategies for Enhanced Livability in Dukem Sub-city. The primary goal of the study was to scrutinize the challenges faced in the streetscape of Dukem Sub-city and formulate efficient strategies to improve the overall livability of the urban area. To accomplish these objectives, a blend of data collection methods, encompassing surveys, observations, and key informant interviews, was employed. Subsequently, statistical methods were applied to scrutinize and elucidate the collected data.

4.2. The respondents' demographic characteristics

4.2.1. Rate of respondent

The survey questions were designed to encompass economic and demographic factors, including gender, age, educational background, employment status, and income, aiming to discern the socioeconomic profile of the respondents. A sample of 384 participants was chosen for the closed-ended questionnaire and distributed among street users in the study area. However, only 360 questionnaires were returned. Consequently, the researcher analyzed and interpreted the data from the collected 360 questionnaires, as presented in Table 4 below.

Table 4: Respondent's rate

Responded	No responses	Total
360 (93.8%)	24(6.2%)	384(100%)

4.2.2. Socio-economic characteristics of respondent

The results of the questionnaire survey show that among 360 sampled street users, 38.4% are female and 61.6% are male (Figure 4).

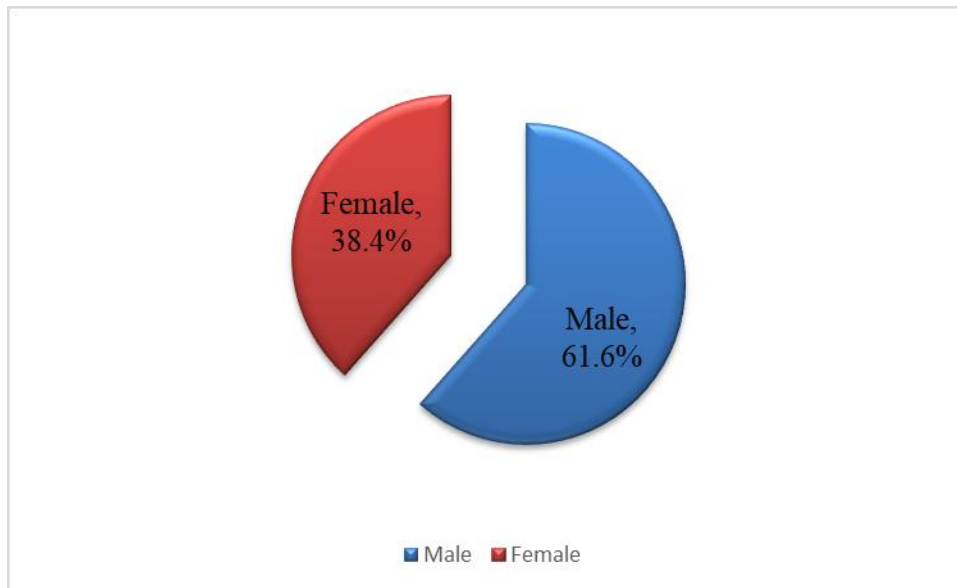


Figure 4:- Sex Composition of Respondents

In relation to the distribution of respondents based on their ages, there is a noticeable variation among different age groups. The lowest representation is observed in the age group of 50 years and above, comprising only 4.1% of the respondents. Following this, the age bracket of 41–50 years exhibits a range of 18.3% to 31.6%. Moving to the younger demographic, the age group of 18–30 years constitutes the highest proportion, ranging from 31.6% to 45.8%. Lastly, the age group of 31–40 years falls between these extremes, accounting for 45.8% of the respondents (Figure 5). This diverse distribution across age categories provides valuable insights into the demographic composition of the surveyed population, highlighting variations in responses and perspectives based on age cohorts.

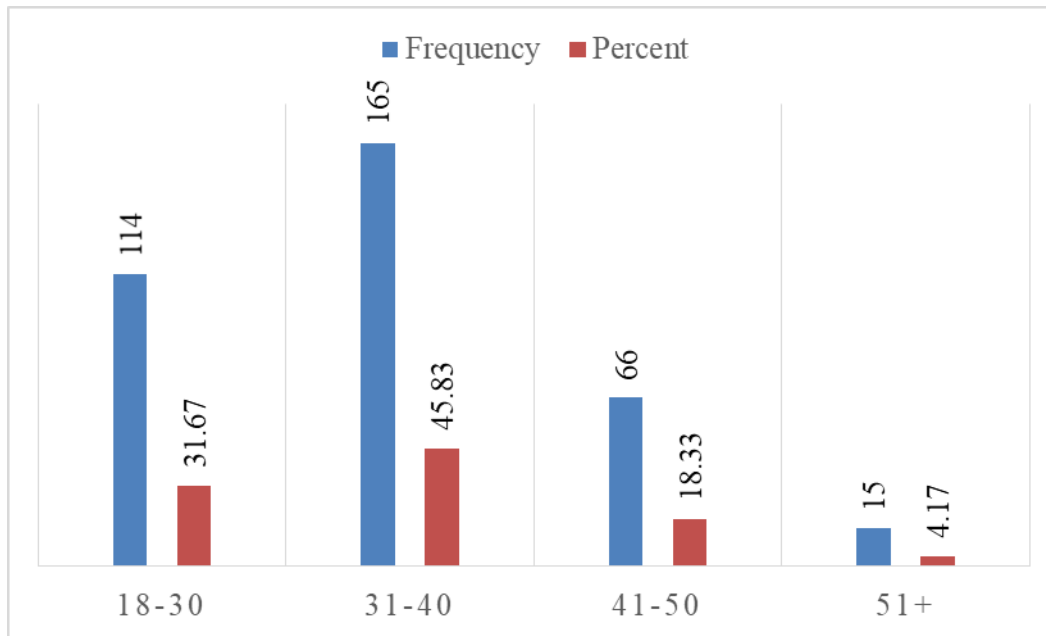


Figure 5:-: Age Composition of Respondents

Comprehensive data on educational status was collected as it plays a pivotal role in understanding the challenges associated with the streetscape and its overall impact. Figure 6 visually represents the educational backgrounds of the individuals who participated in the interviews. Among the total respondents, 4.4% reported being unable to read or write, 11.1% indicated they could read and write but had not completed elementary school (grades 1-8), 17.5% had successfully completed elementary school, 27.2% had finished secondary school (grades 9-12), and the majority, comprising 39.7%, had attained a college or university degree (Figure 6). These findings highlight the diverse educational backgrounds of the respondents in the study area, revealing a generally educated population based on the outcomes of this research.

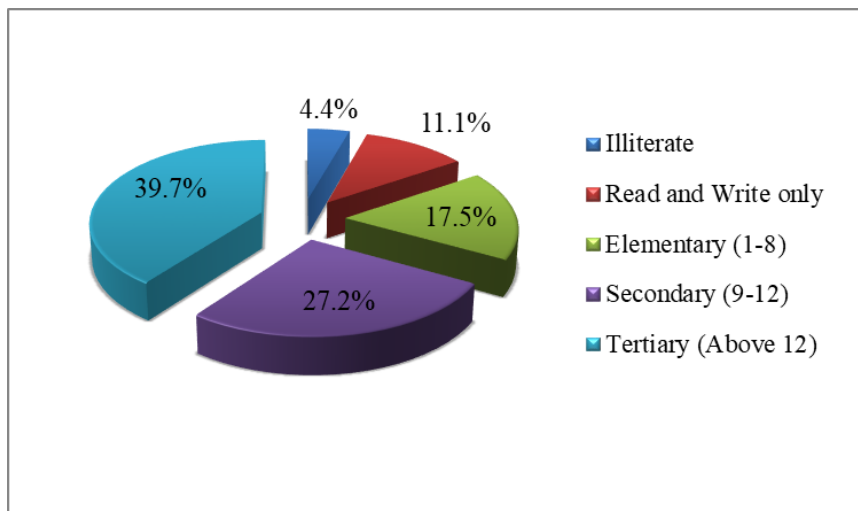


Figure 6:- Education level of the respondents

The figure 7 illustrates the employment status of street users based on different categories. Among the respondents, 23.9% are employed in government positions, 14.72% work in Non-Governmental Organizations (NGOs), 27.78% are employed in the private sector, and 33.61% are currently unemployed. This breakdown provides insights into the diverse employment backgrounds of street users, highlighting the significant representation of individuals from various sectors, including government, NGOs, and the private industry, alongside a notable proportion of unemployed individuals within the surveyed population.

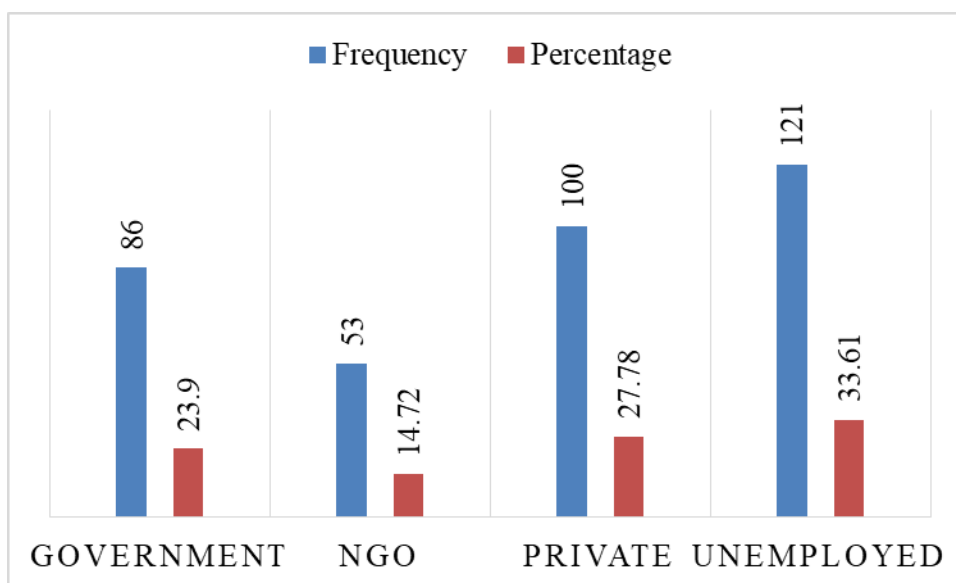


Figure 7:- Employment status of the respondent

The table 5 provides a breakdown of the monthly income distribution among the surveyed participants across different categories. A total of 20 respondents, constituting 5.6% of the sample, reported a monthly income within the range of 500 to 1500 units. The majority of participants, comprising 14.2%, fell into the income bracket of 1501 to 3500 units per month. A significant portion of the surveyed population, representing 28.6%, reported a monthly income ranging from 3501 to 6500 units. Additionally, 20.0% of respondents reported an income between 6501 and 8500 units, while 13.9% fell into the category of 8501 to 10000 units. The highest income bracket, exceeding 10000 units per month, was reported by 17.8% of participants. This detailed breakdown illuminates the diverse income levels within the surveyed population, providing a nuanced understanding of the financial landscape among the respondents.

Table 5: Monthly income of respondents

Category	Frequency	Percentage
500-1500	20	5.6
1501-3500	51	14.2
3501-6500	103	28.6
6501-8500	72	20.0
8501-10000	50	13.9
>10000	64	17.8

4.3. Current Condition of Existing Streetscape

Stretching for a substantial 3.5 kilometers, the chosen street in Dukem Sub City winds its way from the bustling Addis Kera Asphalt road up to the heart of the East Industry Zone. This artery of urban life pulsates with a diverse mix of land uses, a tapestry woven with threads of commerce, industry, and daily living.

Commercial activities reign supreme, their energy evident in the vibrant storefronts lining the street. Cafés and shops beckon passersby, while bustling markets offer a kaleidoscope of goods. Mixed-use developments rise here and there, blending commercial spaces with residences, creating a dynamic hub of activity.

Yet, the street's character is not solely defined by commerce. Residential pockets nestled amidst the commercial frenzy offer glimpses into the lives of those who call this urban artery home. Industrial giants, their chimneys spewing plumes of smoke, stand as testaments to the city's economic engine.

The physical realm of the street itself tells its own story. A single lane of asphalt, once smooth and efficient, now bears the scars of time and traffic. Cracks snake their way across the surface, a testament to the constant flow of vehicles and pedestrians. Yet, despite its wear and tear, the asphalt remains a vital artery, connecting diverse destinations and facilitating the daily rhythms of the city.

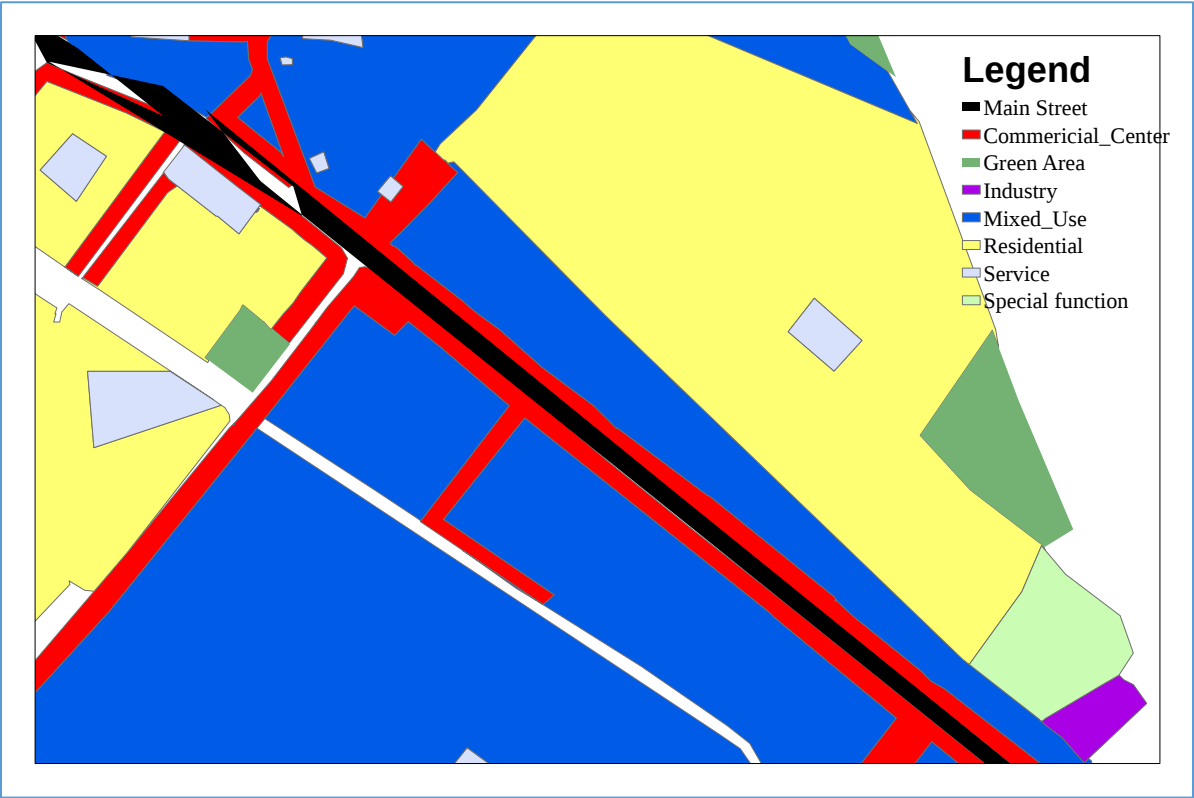


Figure 8:- Existing Land Use

4.3.1. Streetscape Elements and Existing Street Utilities and Services

The streetscape in Dukem Sub-City stretching from Addis Kera Asphalt road up to the heart of the East Industry Zone presents a stark picture of a neglected and under-resourced environment. A closer look at the data collected reveals a plethora of deficiencies hindering the street's livability and user experience. The table below shows streetscape elements and existing street Utilities and services:

Table 6: Streetscape elements and existing street Utilities and services in the study area

Streetscape Element or Utility	Available	Less Available	Not Available at All	Observations
Street lights	-	x	-	Few scattered lights present, but overall illumination inadequate.
Trash cans	-	-	x	None observed, creating sanitation and hygiene concerns.
Public art	-	-	x	No public art installations currently present.
Public toilets	-	-	x	Lack of public toilets poses inconvenience for pedestrians and users.
Traffic signs and signals	-	x	x	Some basic signs present, but many missing or poorly maintained, leading to confusion and potential safety hazards.
Street trees and horticulture	-	x	-	A few isolated trees, but overall the streetscape lacks greenery and shade.
General public furniture	-	-	x	No benches, shelters, or other amenities for pedestrian comfort and gathering.
Advertising signs and decorations	x	-	-	Numerous advertising signs, often cluttered and visually overwhelming.
Bicycle facilities (bike lanes, racks)	-	-	x	No dedicated infrastructure for cyclists, discouraging this sustainable mode of transport.

Iconic buildings or heritage elements	-	x	-	Aba Gada statue stands out as a landmark, but overall the street lacks architectural character.
Public transport infrastructure	-	-	x	No bus stops, designated shelters, or dedicated lanes for public transport.
Sidewalks/footpaths	-	x	-	Sidewalks present but narrow, unpaved, and often obstructed by vendors and parked vehicles, hindering pedestrian movement.
Pedestrian pavements	-	x	-	Pavements uneven and poorly maintained, posing tripping hazards and accessibility challenges.
Ditches	x	-	-	Open ditches present, raising sanitation and safety concerns, particularly for pedestrians with disabilities.
Crossings	-	x	-	Few designated crossings, leading to pedestrians crossing at unsafe locations.
Disability access	-	-	x	No ramps, lowered curbs, or other features to accommodate people with disabilities.
Frontage cafes	-	-	x	No outdoor seating or cafe culture observed along the street.
Vending activities	x	-	-	Widespread street vending, while providing economic opportunities, often obstructs pedestrian flow and creates congestion.

The assessment of the existing conditions of the street elements in the Addis Kera Asphalt road up to the heart of the East Industry Zone of Dukem sub-city reveals a range of challenges and

deficiencies across various streetscape components. Based on the information observed from the filed visit, the street lights, while present, are insufficient in number, leading to inadequate overall illumination. The absence of trash cans poses sanitation and hygiene concerns, with no designated infrastructure for waste disposal. Public art installations are entirely absent, contributing to a lack of cultural and aesthetic vibrancy in the area.



Figure 9: Street with Limited Street light

Moreover, the scarcity of public toilets is a notable inconvenience for pedestrians and users, impacting the overall accessibility and usability of the street. The condition of traffic signs and signals is suboptimal, with some basics in place but many missing or poorly maintained, resulting in confusion and potential safety hazards for both pedestrians and drivers.

The streetscape's greenery is limited, with a few isolated trees but an overall lack of street trees. This deficiency contributes to a dearth of shade and visual appeal. The absence of general public furniture, such as benches and shelters, diminishes pedestrian comfort and gathering spaces. Furthermore, the prevalence of numerous advertising signs, often cluttered and visually overwhelming, detracts from the overall aesthetic quality of the streetscape.

The inadequacy extends to bicycle facilities, with no dedicated infrastructure for cyclists, discouraging the promotion of sustainable transportation modes. Although the Aba Gada statue stands out as a landmark, the overall street lacks iconic buildings or heritage elements that could enhance its architectural character.

Public transport infrastructure is virtually non-existent, with no bus stops, designated shelters, or dedicated lanes for public transport. Sidewalks are present but narrow, unpaved, and frequently obstructed by vendors and parked vehicles, hindering pedestrian movement. The pedestrian pavements are uneven and poorly maintained, posing tripping hazards and accessibility challenges.

Open ditches pose sanitation and safety concerns, particularly for pedestrians with disabilities. Few designated crossings contribute to pedestrians crossing at unsafe locations, further exacerbating safety risks. Disability access is virtually absent, with no ramps, lowered curbs, or other features to accommodate people with disabilities.



Figure 10: Open ditches in the study area

Frontage cafes and outdoor seating, characteristic of vibrant street cultures, are entirely lacking along the street. Widespread Street vending, while providing economic opportunities, obstructs pedestrian flow and creates congestion, impacting the overall functionality and safety of the street.

4.3.2. Street connectivity and mobility

Observing the streetscape through the lens of connectivity and mobility reveals a stagnant engine in Dukem Sub-city. While the streets teem with activity, it's a chaotic dance lacking basic

infrastructure for smooth movement. The table below shows street connectivity and mobility form the Addis Kera Asphalt road up to East Industry Zone Street:

Table 7: Observations on Street Connectivity and Mobility in Dukem Sub-city

Element	Highly Obtainable	Less Obtainable	Not Obtainable at All	Observations
Public Transport Options	-	x	-	Limited options. Only Bajajs and limited taxis observed, no buses, or designated stops.
Vehicular Stops	-	-	x	No designated areas for vehicles to stop, leading to congestion and safety hazards.
Waiting Areas	-	-	x	No shelters or designated spaces for pedestrians to wait for transport, exposing them to harsh weather conditions.
Car Parking	-	-	x	Lack of formal parking spaces leads to cars encroaching on sidewalks and blocking pedestrian flow.
Appropriate Alleys	-	-	x	Absence of dedicated service alleys leads to delivery vehicles and vendors obstructing traffic and pedestrian movement.
Lanes	-	-	X	Lanes not present.
Junctions	x	-	-	Junctions present but lack clear signage and traffic control measures, increasing risk of collisions.

Squares	-		X	No square observed
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Table 7 above presents a comprehensive analysis of street connectivity and mobility in Dukem Sub-city, highlighting critical observations across various elements. The limited availability of public transport options is a notable concern, with only Bajajs and limited taxi observed, lacking buses, or designated stops. This deficiency in public transport infrastructure can impact accessibility and convenience for residents.



Figure 11: Bajajs as Public Transport Options in the study area

The absence of designated vehicular stops contributes to congestion and safety hazards, as vehicles have no formal areas to stop. Similarly, the lack of waiting areas, including shelters or designated spaces for pedestrians, exposes individuals to harsh weather conditions while waiting for transportation.

Car parking is a significant issue, with a complete lack of formal parking spaces leading to cars encroaching on sidewalks and impeding pedestrian flow. This not only affects the safety of pedestrians but also contributes to overall traffic congestion.

The non-existence of appropriate alleys for service purposes results in delivery vehicles and vendors obstructing both traffic and pedestrian movement. This adds to the challenges of maintaining a smooth and efficient flow of both vehicular and pedestrian traffic.

The absence of squares is another notable observation, impacting the social and recreational aspects of the urban environment. Public squares serve as focal points for community interaction and cultural activities, and their absence suggests a lack of communal spaces for residents.

4.3.3. Existing Urban Fabric

Based on the data obtained from the filed observation, the urban fabric of the street leading from Addis Kera Asphalt road to Eastern Industry Zone Street in Dukem sub-city presents a complex and dynamic picture with both positive and negative aspects. The table below shows Existing Urban Fabric from Addis Kera Asphalt road up to East Industry Zone Street.

Table 8: Observation Checklist for the Existing Urban Fabric

Check List for the Existing Urban Fabric	Descriptions
The Character of the Built Mass	Buildings along the street are characterized by a mix of grain, fine grain, and fine mass. The urban fabric comprises both modern structures and old, deteriorated buildings along the stretch from Addis Kera Asphalt road up to East Industry Zone Street.
The Architectural Style	While the sub city lacks a defined architectural style, this street exhibits a transition with the emergence of modern buildings, particularly for hotels, mixed-use structures, and offices. This transition involves the demolition of known traditional architectural styles.
Heights, Massing Volumes, Materials	Ongoing construction features a variety of building heights, including high, medium, and small-scaled volumes. Various materials contribute to the diversity of the urban fabric.

Projections onto the Street	Some buildings cast shadows on the street, providing shading benefits. However, challenges arise on pedestrian walkways, as these structures lack dedicated parking spaces, leading users to park vehicles on sidewalks, obstructing pedestrian pathways.
Adjacent Land Use(s)	The immediate surroundings are predominantly characterized by commercial and mixed-use land-use types. Other adjacent areas exhibit a mix of different land-use types, contributing to the overall diversity of the urban fabric.
Interaction with the Public Domain	The majority of buildings demonstrate high interaction with the public domain. Given the prevalent commercial and mixed-use activities along the street, these urban fabrics are closely linked to the public and societal functions.
Kind of Life Accommodated within the Built Fabric	Most built fabrics primarily accommodate temporary life, serving specific purposes such as markets or commercial activities. The structures are not extensively used for permanent residency. Various demographics, including children, young adults, and the elderly, engage with these built fabrics for diverse activities.

The street presents a fascinating patchwork of building sizes and styles. A mix of fine-grained traditional structures, characterized by intricate details and low height, stands alongside modern, high-volume developments with sleek lines and expansive glass facades. This juxtaposition creates a dynamic visual contrast, showcasing the ongoing transformation of the area. However, the presence of dilapidated buildings within this diverse mix raises concerns about preserving the street's historical character and addressing issues of urban decay.

Unlike some towns with a unified architectural identity, this street lacks a cohesive design language. While the modern buildings bring a touch of contemporary flair, their stark contrast with the traditional structures can feel jarring and disrupt the sense of place. This lack of stylistic coherence could be addressed through urban design guidelines and planning initiatives that

encourage architects to consider the existing context and incorporate traditional elements into their designs, creating a more harmonious streetscape.

The street's skyline is far from monotonous. Buildings vary significantly in height and volume, with high-rise towers looming over mid-rise structures and charming single-story shops. This variation contributes to the street's dynamic character and visual interest. However, the placement of some high-volume buildings creates challenges for pedestrian comfort. Shadows cast by these structures can significantly reduce sunlight penetration, potentially hindering street tree growth and impacting the overall ambience. Careful consideration of building massing and its impact on the public realm is crucial during future development.



Figure 12: Buildings in the street of the study area

While architectural projections like overhangs can add visual interest and provide shade, some observed on this street pose challenges for pedestrians. The lack of dedicated parking spaces forces building users to park on sidewalks, significantly narrowing the already limited walkways and creating obstacles for pedestrians. This issue requires creative solutions, such as mandatory provision of on-site parking or designated off-street parking areas, to ensure pedestrian safety and accessibility.

The street's primary character is defined by its predominantly commercial and mixed-use land uses. These generate vibrant activity and economic opportunities, attracting shoppers, vendors, and business owners. However, introducing a wider range of land uses, even in smaller proportions, could create a more diverse and functional urban environment. Including residential spaces, cultural venues, or green areas could attract new user groups and foster a more balanced streetscape.

The high level of interaction between buildings and the public domain is a positive aspect. The commercial and mixed-use nature of the street encourages pedestrian activity and creates a lively atmosphere. However, ensuring that this interaction is positive requires addressing issues like sidewalk encroachment by vendors and parked vehicles. Implementing measures to reclaim pedestrian space and improve sidewalk safety is crucial to enhance the public realm experience.

The street currently caters primarily to temporary users like market vendors and commercial establishments. While this contributes to the bustling atmosphere, it also limits the type of life and activities that can thrive there. Encouraging permanent residents through diverse mixed-use development and creating high-quality public spaces can attract a broader range of users and foster a more vibrant community.

4.3.4 Existing sidewalk width with master plan and standards

Table 9 below illustrates that the existing sidewalk width is not wide enough when compared with the city’s structural plan and with the standard walkway width. The existing sidewalk width on the ground and the structural plan are not fit, and this resulted in discouraging walkability.

Table 9: Existing side walk width in study area.

Location	Width of main road in meter (m)	Existing pedestrian width in meter (m)	Width of main road on structural plan in meter (m)	Side walk Standard	Gap
Study areas main road	20m	2m	30m	3.5-5m	1.5-2.5m

Within the specified study area, the primary road boasts a width of 20 meters. However, the current pedestrian width is notably restricted, measuring only 2 meters. The proposed adjustments outlined in the structural plan advocate for an increased pedestrian width, ranging between 3.5 to 5 meters.

This proposed expansion indicates a deliberate effort to enhance the overall pedestrian experience within the urban landscape.

Moreover, the structural plan recommends maintaining a standard gap of 1.5 to 2.5 meters between the road and the pedestrian area. While these measurements may be subject to local regulations, this intentional separation serves multiple purposes. Primarily, it allows for a more generous pedestrian zone, contributing to increased comfort and safety for individuals on foot. Simultaneously, the designated gap serves as a buffer zone, promoting a safer coexistence between pedestrian and vehicular traffic. Additionally, this space facilitates the integration of essential infrastructure components, ensuring a holistic approach to urban planning and development. Overall, these proposed adjustments align with the broader goals of enhancing urban mobility, safety, and the overall quality of the pedestrian environment.

4.4. Streetscape challenges that influence the livability of the urban environment

Dukem sub-city's street from Addis Kera Asphalt road up to East Industry Zone Street, while bustling with activity, face significant challenges that hinder their livability and pose safety risks. This multi-perspective study, drawing from data and insights gathered through detailed observations, key informant interviews, and pedestrian surveys, paints a comprehensive picture of these concerns. The voices of pedestrians, drivers, and professionals paint a clear picture of the issues and their impact on daily life.

4.4.1. Inadequate Pedestrian Infrastructure and Amenities

The analysis of the information obtained from key informant interviews emphasizes the significant issue of a lack of shade trees along the streetscape from Addis Kera Asphalt road up to East Industry Zone Street. One of the key informants highlighted the critical nature of this challenge:

"Without shade, walking during midday is unbearable. Temperatures can reach 29°C, making it dangerous for children and the elderly."

The pedestrian community's concern about the availability of tree shades was addressed through a survey, and their responses are summarized in Figure 13:

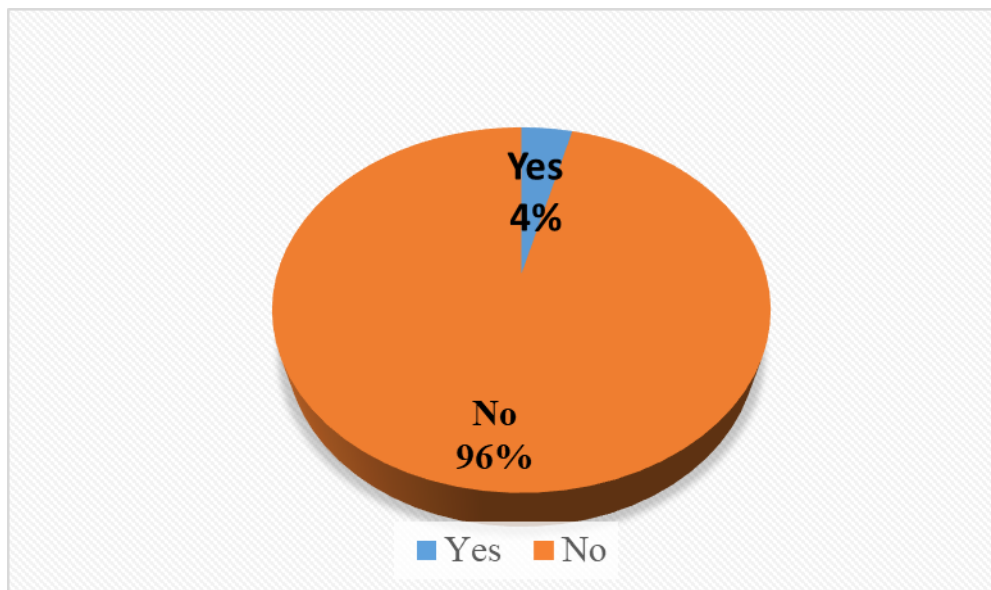


Figure 13: Availability of tree shades.

The data in Figure 13 indicates a clear consensus among respondents, with the majority expressing dissatisfaction with the current availability of tree shades along the specified street. Only 4% of respondents believed that there is enough tree shade for pedestrians, while a significant 96% disagreed, signaling a widespread perception that the street lacks adequate tree cover. The researcher's on-site observations further validate this sentiment, noting the absence of street trees serving as shade for pedestrians.

The interview findings and survey results underscore the adverse impact of the insufficient tree shade on pedestrians. With temperatures reaching 29°C, walking without shade during midday becomes not only uncomfortable but also poses potential dangers, especially for vulnerable groups such as children and the elderly. This highlights the urgent need to address the lack of tree shades to enhance the comfort and safety of pedestrians using the street.

Poor lighting in urban areas can have significant implications for public safety, and crime statistics often reflect the correlation between poorly lit areas and increased criminal activities. In the context of the pedestrian survey conducted in Dukem sub-city from Addis Kera Asphalt road up to East Industry Zone Street, the data indicates a substantial concern among respondents regarding inadequate lighting, with potential consequences for both actual safety and the perceived fear of crime. Poorly lit areas often correlate with increased crime rates, creating safety concerns for

residents and pedestrians. The survey results highlight a substantial safety apprehension among respondents. A significant 75% of survey participants expressed feeling unsafe when walking at night due to inadequate lighting. This percentage underscores the gravity of the issue and emphasizes the urgent need for improvements in street lighting infrastructure. The availability of night street lights is a key factor influencing the perception of safety among pedestrians. The data presented in Table 10 provides a detailed breakdown of respondents' observations and beliefs regarding the adequacy of night street lights.

Table 10: Availability of night street lights

Availability of night street lights	Percent
Yes	46.0
No	54.0
Total	100.0

According to the survey, in evaluating the observations of respondents regarding the availability of night street lights, a notable divide emerged. A significant 54% of participants expressed dissatisfaction, reporting a lack of sufficient street night lights. Their observations indicated that existing street light lines were non-functional, and critically, there was a noticeable absence of dedicated pedestrian night lights. On the other hand, an intriguing 46% of respondents held a contrasting belief, considering the current street lighting to be adequate for pedestrians. However, it is crucial to highlight that their definition of "enough" encompassed alternative sources such as shop lights and car lights. Despite expressing this perception, respondents displayed a hesitancy to unequivocally affirm the presence of adequate night lights, suggesting a nuanced and complex understanding of the lighting situation among this particular subset of participants.

The assessment of sidewalk conditions along the stretch from Addis Kera Asphalt road up to East Industry Zone reveals a myriad of challenges, particularly in terms of obstacles encountered by pedestrians. Through direct observation, it was evident that various obstacles impede the smooth passage of pedestrians, presenting a significant concern for those with disabilities. The accompanying figure illustrates the diverse types of obstacles found on the sidewalk.



Figure 14: Diverse types of obstacles found on the sidewalk

In response to a query about the presence of obstacles, 68% of respondents affirmed encountering impediments, while 32% reported otherwise. Those acknowledging obstacles provided a detailed account of the hindrances present in the area. Noteworthy obstructions included construction materials such as stones, sands, and steel, contributing to an obstructed path. Additionally, respondents highlighted challenges posed by garbage piles, limited frontage distance, and various manholes.

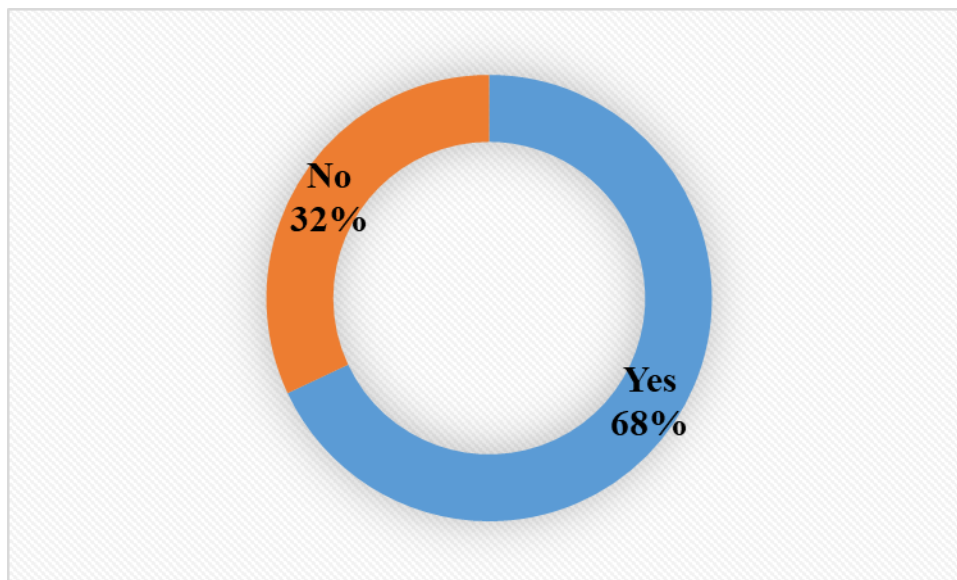


Figure 15: Obstacles found on the sidewalk

On another front, street vending emerged as a prominent obstacle, featuring prominently in the urban landscape. The figure depicting street vending underscores the prevalence of this challenge, affecting the overall usability of sidewalks. The impediments presented by compacted population, open ditches, advertisement equipment, utility lines like electric poles, unfinished sidewalks, and makeshift shades for roadside activities further accentuate the complexity of navigating this street.



Figure 16: Street Vending in the study area

The streetscape of Dukem Sub-city, spanning from Addis Kera Asphalt road up to East Industry Zone, faces significant challenges, prominently marked by the absence of basic street amenities and furniture. Key informants unanimously identified a stark absence of basic street amenities along the surveyed main road. The term "amenities" encompasses crucial elements such as seating

areas, waste bins, and shelters, which are vital for enhancing the comfort and convenience of pedestrians. The dearth of these amenities contributes to a diminished quality of the streetscape, impacting the overall experience for residents and passersby.

The absence of street furniture further compounds the challenges faced by residents and visitors. The term "furniture" refers to infrastructure such as benches, public seating, or other elements designed for public use. Without these, individuals lack spaces to rest, wait, or engage in community activities. This deficiency not only affects the aesthetic appeal of the street but also hinders its functionality as a communal space.

The dissatisfaction among respondents regarding the current state of the main road in the studied areas is a significant revelation. A mere 16.6% of respondents expressed belief that the main road is furnished with all necessary amenities, while a substantial 83.4% disagreed with this assertion. This stark contrast highlights a prevailing sentiment of discontent among the community, emphasizing the urgency for improvements in street infrastructure.

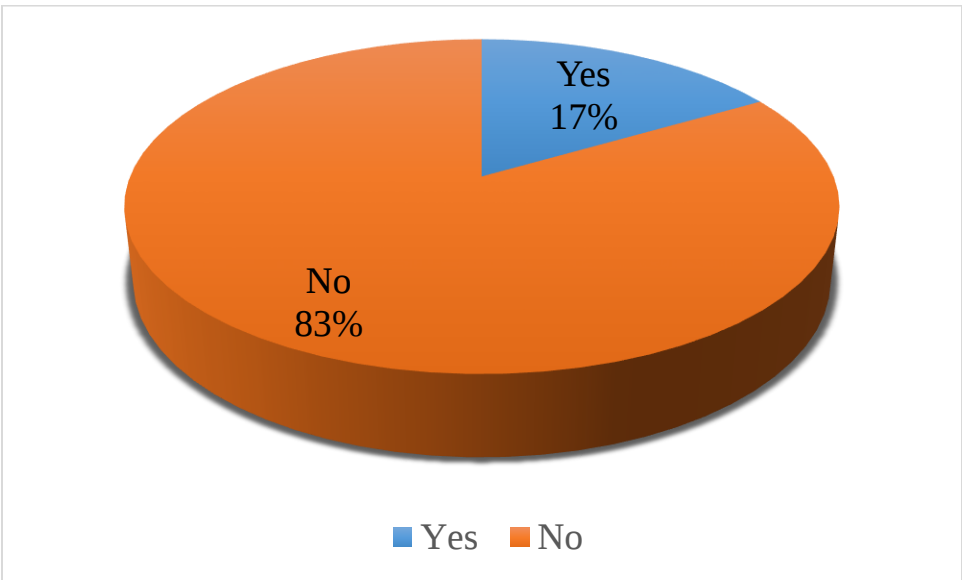


Figure 17: Street furnished with all-street amenities
The lack of basic amenities and furniture directly influences the livability of the area. Public spaces that lack seating, shelter, and aesthetic elements become less inviting and fail to cater to the diverse needs of the community. The dissatisfaction expressed by the majority of respondents underscores the critical role that street amenities and furniture play in enhancing the overall quality of urban life.

4.4.2. Incompatibility with Diverse Users

The survey's inquiry regarding the suitability of the sidewalk from Addis Kera Asphalt road up to East Industry Zone for various groups, namely the elderly, disabled individuals, bicyclists, and street vendors, illuminates significant concerns about the current state of accessibility in this urban thoroughfare. The collected data, as summarized in Table 11, reveals that a staggering 93.3% of respondents, expressed the belief that the existing sidewalk is not suitable for the mentioned groups. In stark contrast, only 6.7% of respondents, considered the sidewalk appropriate for these specific user categories.

Table 11: Suitable for the different kinds of peoples

Response	Percent
Yes	6.7
No	93.3

The overwhelmingly negative perception of the sidewalk's suitability for diverse user groups aligns with existing literature emphasizing the critical role of inclusive urban design for fostering accessibility. Research underscores that sidewalks are a fundamental component of urban infrastructure, serving as vital pathways for pedestrians, including the elderly and disabled individuals, who often face mobility challenges. Moreover, accommodating bicyclists and street vendors requires thoughtful urban planning to ensure a harmonious coexistence of various modes of street use.

Literature on urban design and accessibility stresses the importance of creating environments that cater to diverse user needs. In the context of this survey, the majority's perception aligns with the principles advocated in urban planning literature, which emphasizes the need for well-designed sidewalks to accommodate the elderly, disabled, bicyclists, and street vendors. The identified inadequacies may include uneven surfaces, insufficient curb cuts, or limited space, hindering the comfortable and safe movement of these groups.

The survey results, coupled with the supportive literature, underscore a pressing need for urban planners and policymakers to address the identified shortcomings in the sidewalk infrastructure. By doing so, they can contribute to the creation of an inclusive urban environment that caters to

the needs of all community members. This aligns with the broader goal of fostering livable, accessible, and sustainable cities for the present and future generations.

4.4.3 Congested and Uncomfortable Vehicular Traffic

The streetscape from Addis Kera Asphalt road up to East Industry Zone Street in Dukem Sub-city faces a significant challenge characterized by congested and uncomfortable vehicular traffic. This assertion is based on key informant interviews and detailed observations conducted to assess the existing state of the streetscape. The information gathered highlights several key aspects contributing to the congestion and discomfort experienced by both drivers and pedestrians along this stretch.

Site observations clearly show that the study road segment's on-street parking trespasses on the carriageway's effective width. The planned street performance is diminished by road encroachment brought on by on-street parking. The study showed that there is a measurable decrease in the capacity of lane width. But there is no measurable decrease in urban street capacity when through lane widths are narrowed from 3.5 m to 2.5 m. Almost 2.5 meters of the carriageway from the street's curb were taken up by on-street parking during the busiest time of the day that the study road linkages had on-street parking. Thus, it's empirical to deduce that the safety, speed, and capacity of the urban arterial road were significantly reduced.

Key informant interviews were a vital source of information, capturing the perspectives of individuals with valuable insights into the local traffic dynamics. During these interviews, key informants consistently emphasized the increasing vehicular density, particularly during peak hours. The substantial growth in population and economic activities in the area has led to a surge in the number of vehicles, surpassing the existing infrastructure's capacity to efficiently accommodate them. This surge has resulted in traffic bottlenecks, prolonged waiting times, and overall discomfort for both drivers and pedestrians.



Figure 18: Traffic Congestion in the study area

The data extracted from the observations, specifically presented in figure 14, reinforces the argument concerning congested and uncomfortable vehicular traffic along the stretch from Addis Kera Asphalt road up to East Industry Zone Street. The figure systematically categorizes various vehicle types, including motor bicycles, Bajaj, and cars, based on the time it takes them to traverse this particular street.

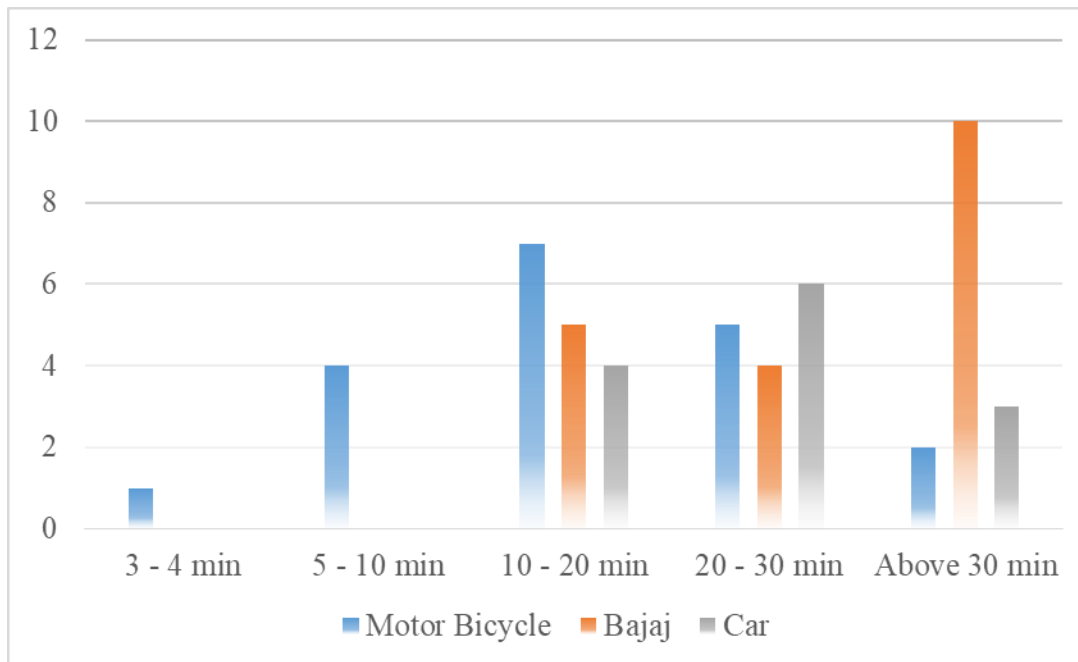


Figure 19: Type of Vehicle and Time to reach

The figure 19 provides a comprehensive insight into the time required for various vehicles to reach the stretch from Addis Kera Asphalt road up to East Industry Zone Street. Notable observations emerge from the data, delineating distinct challenges faced by different types of drivers. Motor bicycle drivers, despite their smaller and more agile vehicles, encounter varying crossing times, with a majority (7 respondents) taking 10-20 minutes. This highlights that even nimble modes of transportation are not exempt from the hurdles posed by the congested street. In contrast, Bajaj drivers, grappling with more significant challenges, present a spectrum of crossing times. A substantial portion (5 respondents) faces delays of 10-20 minutes, while a noteworthy number (10 respondents) contends with even lengthier durations, signifying pronounced congestion and obstacles to vehicular flow. Car drivers, operating larger vehicles, generally report extended crossing times, with 6 respondents noting durations of 20-30 minutes and 3 respondents experiencing delays surpassing 30 minutes. These findings underscore challenges unique to larger vehicles navigating through the congestion, emphasizing the need for targeted interventions to improve traffic management and enhance the overall vehicular experience along this crucial street.

Additionally, the key informant interviews unveiled perceptions of discomfort among drivers using this stretch. The negative impressions were primarily rooted in the physical form and infrastructure of the street. Informants highlighted the narrowness of the road, lack of

refurbishment, and the presence of numerous potholes, creating an uncomfortable driving experience. Bajaj drivers, in particular, expressed the struggle to navigate through the congested street, contributing to extended crossing times and operational difficulties.

The pedestrian survey delved into the challenges of congestion experienced by pedestrians along the street stretching from Addis Kera Asphalt road up to East Industry Zone Street. The analysis of responses reveals a significant concern among pedestrians regarding the congestion levels on this street. A substantial portion of respondents, comprising 42.9%, expressed that the congestion is perceived as "very bad," while an additional 42.1% deemed it as "bad." This collective sentiment underscores the substantial impact of on-street parking, contributing to difficulties and inconveniences for pedestrians and disrupting the smooth flow of pedestrian traffic.



Figure 20: on street parking that create congestion in the study area

A smaller percentage of respondents, 12.9%, rated the congestion as "fair," and only 2.1% considered it "good," as depicted in Table 12. This disparity in responses highlights a consensus among pedestrians regarding the adverse effects of congestion, emphasizing the need for interventions to alleviate these challenges and enhance the overall pedestrian experience on the street.

Table 12: Congestion faced by pedestrians in study area.

Variables	Category	Percentage
Congestion faced by pedestrians	Very bad	42.9%
	Bad	42.1%
	Fair	12.9%
	Good	2.1%

Research in urban planning and transportation studies has consistently highlighted the negative consequences of pedestrian congestion on urban streets. A study by Gehl (2010) emphasized the importance of creating pedestrian-friendly environments to enhance the overall quality of urban life. The findings from Gehl's study align with this study, suggesting that a smaller percentage of respondents rating congestion as "fair" or "good" reflects a common concern about the adverse effects of congestion.

Moreover, Newman and Kenworthy (1999) argued that well-designed urban spaces, free from excessive congestion, contribute to a sense of place and community. The low percentage of respondents considering congestion as "good" in the provided text resonates with the idea that effective interventions are necessary to mitigate congestion-related challenges and promote a positive pedestrian experience.

In contrast, Litman (2012) suggested that certain levels of congestion might be inevitable in vibrant urban areas and can contribute to economic activity. This perspective contrasts with the negative sentiments expressed by the majority of respondents in this study, indicating a need for nuanced interventions that balance pedestrian comfort with the vitality of urban spaces.

4.4.4. Unplanned and Incompatible Land Use

In Dukem Sub-City from Addis Kera Asphalt road up to East Industry Zone Streets, tell a story of conflict and chaos. Unplanned and incompatible land use reigns supreme, with commercial activities and informal vending spilling into pedestrian spaces, creating a hazardous and frustrating environment for residents.

Information obtained from the filed observation revealed that commercial activities like shops, kiosks, and Tire changing (Gomista) have spilled onto sidewalks and roads. This encroachment shrinks the space available for pedestrians, forcing them to navigate treacherous paths amidst parked cars, overflowing displays, and haphazardly placed construction materials. Surveys conducted with residents and pedestrians quantify the impact of this encroachment. A significant percentage (95%) report feeling unsafe walking on the streets due to the lack of dedicated pedestrian space. Others mention the increased risk of accidents, particularly for children and the elderly. These findings underscore the urgent need to address commercial encroachment and reclaim pedestrian spaces. Observations and interviews with street vendors reveal another layer of

complexity in the land-use puzzle. Informal vending, while providing economic opportunities for many, contributes significantly to pedestrian congestion. Stalls often occupy sidewalks, further shrinking the available space and creating bottlenecks. Imagine a street transformed into a continuous marketplace, leaving barely enough room to squeeze through.

4.5. Impact of streetscape challenges on the livability and quality of life of residents

The streetscape challenges along the stretch from Addis Kera Asphalt Road up to East Industry Zone Street in Dukem Sub-city have profound consequences on the livability and quality of life for its residents. To identify the main impacts that streetscape challenges have on the livability and quality of life for its residents, pedestrians were surveyed. Based on the pedestrian survey, the respondents identified a number of consequences on the livability and quality of life for its residents due to the streetscape challenges along the stretch from Addis Kera Asphalt Road up to East Industry Zone Street in Dukem Sub-city. These include pedestrian safety and comfort, traffic congestion and accidents, noise and air pollution, lack of green spaces, poor community interaction and social cohesion, limited accessibility and mobility, and limited physical activity. Figure 21 below presents the responses of the respondents regarding the consequences on the livability and quality of life for its residents due to the streetscape challenges.

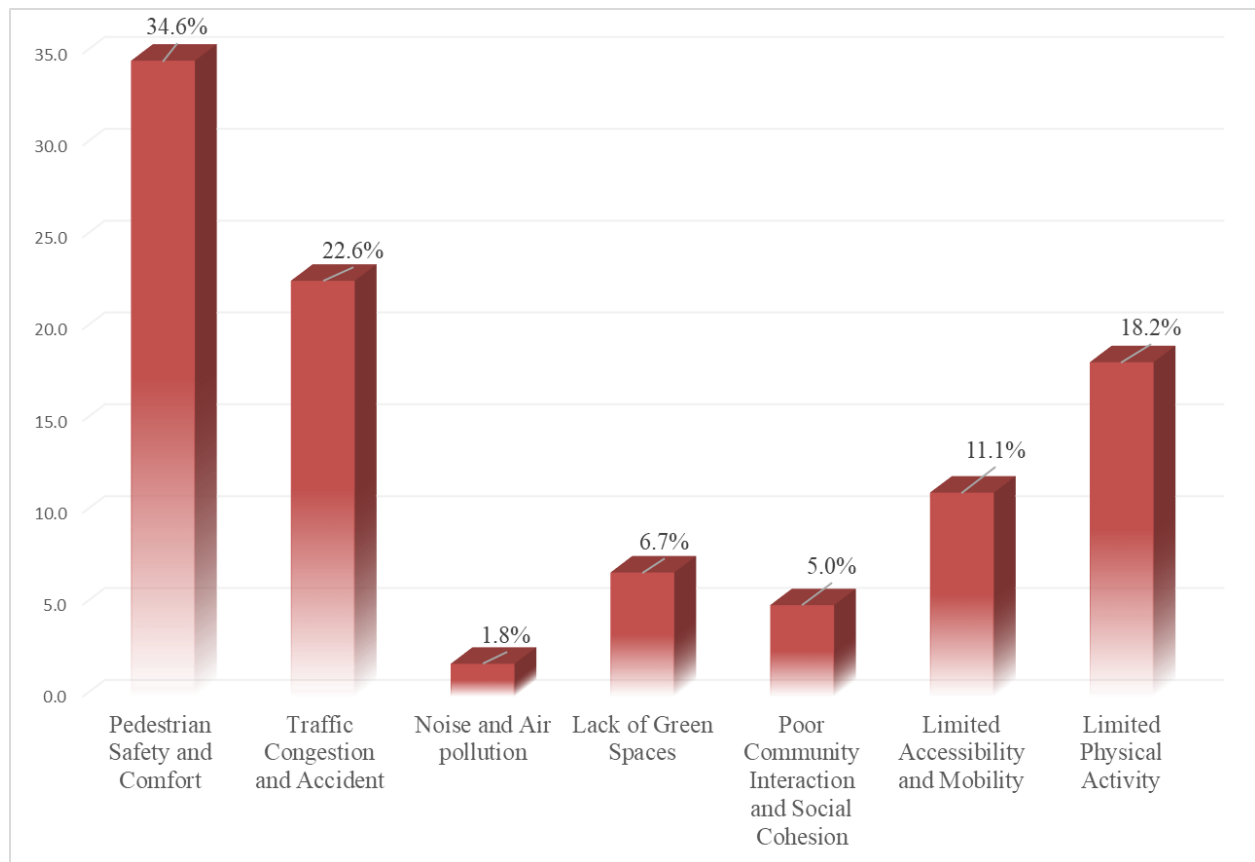


Figure 21: Consequences on the livability and quality of life for its residents due to the streetscape challenge

The consequences identified by the respondents has discussed in detail in below sub-section by supporting with the information obtained from interview and field observation.

4.5.1. Pedestrian safety and comfort

The data presented in the figure above indicates that 34.6% of the respondents highlighted safety and comfort risks for pedestrians as the primary consequences attributed to streetscape challenges, including issues such as insufficient sidewalks, poorly maintained crosswalks, and inadequate lighting. Lack of adequate sidewalks and poorly maintained crosswalks are recognized as significant risk factors for pedestrian safety, as documented in studies conducted in Nairobi, Kenya (Gathungu et al., 2020) and Delhi, India (Sharma & Goel, 2018).

One noteworthy concern is the absence of shade trees along the streetscape, which emerges as a critical factor significantly affecting the comfort and safety of pedestrians. Key informant

interviews underscore the severity of this challenge, particularly during midday when temperatures rise to 29°C. Survey responses further support this observation, revealing that a striking 96% of respondents expressed dissatisfaction with the current availability of tree shades. Notably, based on key informant interviews, the inadequacy of tree cover poses potential dangers, particularly for vulnerable groups such as children and the elderly.

A detailed field observation supports the contention that insufficient street lighting along the stretch from Addis Kera Asphalt Road up to East Industry Zone Street in Dukem Sub-city poses a significant safety risk for residents. According to the pedestrian survey, a substantial 75% of respondents reported feeling unsafe walking at night due to the lack of adequate lighting in the area.

In summary, the figure and associated data shed light on the multifaceted nature of the safety and comfort challenges faced by pedestrians in the specified streetscape. The absence of sufficient sidewalks, poorly maintained crosswalks, and inadequate lighting, compounded by the dearth of shade trees, collectively contribute to an environment that compromises the safety and well-being of residents, particularly during specific times of the day or night.

4.5.2. Traffic congestion and Accident

A substantial proportion, specifically 22.6%, of the surveyed pedestrians perceive challenges in the streetscape as significant contributors to traffic-related problems. An on-site examination revealed that poorly designed streetscapes along the stretch from Addis Kera Asphalt Road to East Industry Zone Street in Dukem Sub-city play a pivotal role in exacerbating traffic congestion. Information garnered from key informants disclosed that insufficient crosswalks, as well as the absence or disrepair of sidewalks along this route, heighten the risks of accidents involving both pedestrians and vehicles. Additionally, inadequately maintained roads contribute to hazards such as tripping and falling.

The sentiments expressed by the majority of participants were largely consistent and can be succinctly summarized as follows:

... "the nexus between streetscape challenges and traffic congestion has led to an increase in commuting times, heightened stress levels, and elevated air pollution, thereby detrimentally impacting the overall quality of life for Dukem Sub-city residents. Moreover,

these challenges impede access to businesses and services, making it more arduous for residents to fulfill their daily needs.”(Key informant interview, 2023)

Research affirms that poorly designed streetscapes not only foster traffic congestion but also contribute to accidents, thereby adversely affecting both the safety and efficiency of urban transportation (Appleyard, 1981).

4.5.3. Limited physical activity

The survey results reveal a substantial 18.2% of respondents expressing significant apprehension regarding the influence of streetscape challenges on the physical activity levels of residents. This concern underscores the importance of investigating the impact of urban design on public health, particularly in the context of walking and cycling habits.

To delve deeper into the issue, information gleaned from key informant interviews and on-site observations highlights the distressing conditions of streetscapes along the corridor from Addis Kera Asphalt Road to East Industry Zone Street in Dukem Sub-city. The documented evidence points towards unsafe and aesthetically displeasing urban environments that effectively discourage pedestrian and cyclist activities.

The adverse impact on physical activity levels becomes evident as individuals are dissuaded from engaging in these healthier modes of transportation, contributing to the prevalence of sedentary lifestyles. The identified stretch of streetscape emerges as a critical focal point where the design flaws hinder the promotion of active commuting habits.

This finding aligns with broader studies in the field, reinforcing the intricate connection between urban environment design and physical activity patterns. As exemplified by Sallis et al. (2016), the scarcity of conducive settings for physical activity within urban spaces can be a significant factor in the development of various health issues. In this specific case, the problematic streetscape design not only impedes the residents' ability to engage in active modes of transportation but also raises concerns about potential health repercussions associated with sedentary behaviors.

4.5.4. Limited Accessibility and Mobility

A considerable portion, specifically 11.1% of the respondents, have expressed concerns about challenges associated with limited accessibility and mobility. The source of this perception is the data gathered from individuals residing in the area spanning from Addis Kera Asphalt Road to

East Industry Zone Street in Dukem Sub-city. These concerns revolve around obstructed sidewalks and the absence of designated spaces for pedestrians and cyclists along this corridor.

The impact of these accessibility limitations is particularly noteworthy for individuals with disabilities. The impediments created by obstructed sidewalks and the absence of dedicated spaces hinder their ability to engage in economic activities. The restricted mobility not only affects their personal mobility but also has broader implications for their inclusion in economic endeavors. This observation resonates with existing literature that underscores the pivotal role of inclusive urban design in ensuring equitable access to essential amenities and services.

A pertinent reference in this context is the work of Cervero and Kockelman (1997), whose research emphasizes the significance of inclusive urban design. The study suggests that urban spaces should be thoughtfully planned and designed to accommodate the diverse needs of the population. In the specific case of the corridor from Addis Kera Asphalt Road to East Industry Zone Street in Dukem Sub-city, the absence of accessible infrastructure poses a barrier to the active participation of individuals with disabilities in economic activities.

4.5.5. Lack of green spaces

According to the data presented in the aforementioned figure, 6.7% of the survey participants acknowledge that the lack of green spaces is a direct outcome of streetscape challenges. This observation aligns with the findings from on-site investigations, suggesting that streetscape challenges play a significant role in the depletion of greenery, trees, and other forms of vegetation within urban settings.

The recognition of streetscape challenges as a contributing factor to the absence of green spaces underscores the intricate relationship between urban design and the availability of natural elements in city environments. Streetscape challenges encompass various issues such as inadequate sidewalks, poor lighting, and overcrowded roads, which collectively impede the integration of green spaces into urban landscapes.

This correlation between streetscape challenges and the scarcity of green spaces is supported by existing literature in urban planning and environmental psychology. For instance, studies have shown that a poorly designed streetscape can deter people from engaging with outdoor spaces,

reducing the likelihood of incorporating green elements into the urban fabric (Gehl, 2010; Kaplan, 1987).

Furthermore, the impact of streetscape challenges on urban vegetation aligns with the broader discourse on the importance of green spaces for enhancing the overall quality of life in cities. Research indicates that the presence of greenery has positive effects on mental well-being, air quality, and community cohesion (Coley et al., 1997; Kuo, 2015). Therefore, addressing streetscape challenges becomes crucial not only for urban aesthetics but also for fostering a healthier and more sustainable urban environment.



Figure 22: Streetscape with limited green space and vegetation

In conclusion, the statistical evidence from the survey, combined with observations in the field, supports the assertion that streetscape challenges are intricately linked to the dearth of green spaces in urban areas. This understanding emphasizes the need for comprehensive urban planning strategies that address streetscape issues to create more conducive environments for the integration of greenery, promoting both aesthetic and ecological benefits.

4.5.6. Limited Community interaction and social cohesion

A notable 5% of the surveyed individuals have expressed apprehensions regarding the repercussions of streetscape challenges on community interaction and social cohesion. The respondents have specifically identified streetscape challenges, including the absence of benches, shaded areas, and insufficient public spaces along the corridor stretching from Addis Kera Asphalt Road to East Industry Zone Street in Dukem Sub-city. These challenges have been identified as impediments to community interactions, leading to a restricted sense of community and connectedness among residents.

The lack of benches and shaded areas diminishes the opportunity for residents to gather, relax, and engage in spontaneous social interactions along the mentioned corridor. Furthermore, the limited availability of public spaces restricts communal activities and events, hindering the formation of a vibrant community life. This echoes the findings of various studies in urban planning and social science literature that emphasize the importance of well-designed public spaces for fostering community cohesion and social interactions.

Research by Gehl and Svarre (2013) emphasizes the significance of creating public spaces that encourage social interactions and community engagement. They argue that well-designed urban environments with inviting streetscapes and communal areas can contribute significantly to community building. Additionally, Jacobs (1961) highlights the role of sidewalks and public spaces in promoting social interaction and fostering a sense of community among residents.

The concerns raised by the respondents align with the broader discourse on the impact of urban design on social dynamics. Inadequate streetscape amenities, as identified by the survey participants, are reflective of a larger issue that resonates with scholarly literature advocating for thoughtful urban planning and design to enhance community well-being.

4.5.7. Noise and air pollution

In accordance with the statistics illustrated in the aforementioned figure, a discernible 1.8% of the respondents in the survey explicitly recognize that both noise and air pollution within the locality are direct consequences stemming from challenges associated with the streetscape. This finding underscores the significant impact of streetscape issues on environmental quality in the area.

Several pieces of literature and research studies substantiate the notion that urban streetscape challenges, such as poor design, inadequate green spaces, and congestion, can indeed lead to heightened levels of both noise and air pollution. For instance, a study by Sosa L, (2017) investigated the correlation between urban streetscape quality and environmental pollution, emphasizing the interconnected nature of these factors. Similarly, the work of Picone et.al. (2023) delves into the adverse effects of street design on air quality, highlighting the need for comprehensive urban planning to mitigate pollution.

The acknowledgment by survey participants of noise and air pollution as direct outcomes of streetscape challenges aligns with broader findings in the existing literature. This not only emphasizes the relevance of addressing streetscape issues for overall environmental well-being but also serves as a call to action for policymakers and urban planners to integrate effective solutions that enhance both the aesthetic and functional aspects of the urban environment while minimizing environmental pollutants.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1. Conclusion

In conclusion, the exhaustive investigation into streetscape challenges along the stretch from Addis Kera Asphalt Road up to East Industry Zone Street in Dukem Sub-city offers a nuanced comprehension of the diverse issues impacting the livability of this urban environment. Derived from meticulous observations, key informant interviews, and pedestrian surveys, the findings reveal the multifaceted nature of challenges faced by residents, pedestrians, and drivers in the area.

Prominent among the identified challenges is the insufficient pedestrian infrastructure and amenities, particularly the absence of shade trees. Survey results and interview findings underscore the adverse impact of this deficiency, with a significant majority expressing dissatisfaction and highlighting discomfort and potential dangers, especially during midday.

Inadequate lighting emerges as another major concern, affecting both actual safety and the perceived fear of crime. Survey results indicate a substantial proportion of respondents feeling unsafe when walking at night due to inadequate lighting. The complexity of the issue is further highlighted by a divide among respondents regarding the adequacy of night street lights, emphasizing the need for nuanced interventions.

The assessment of sidewalk conditions reveals numerous challenges, with various obstacles hindering smooth pedestrian passage, especially for those with disabilities. Street vending, a prominent obstacle, adds to congestion and disrupts the usability of sidewalks.

The absence of basic street amenities and furniture, as highlighted by key informants and survey responses, contributes to a diminished quality of the streetscape, impacting the overall experience for residents and passersby. Dissatisfaction among respondents regarding the current state of the main road underscores the urgency for improvements in street infrastructure.

Incompatibility with diverse users, as revealed by the survey, indicates a pressing need for inclusive urban design. The majority of respondents perceive the existing sidewalk as unsuitable for the elderly, disabled individuals, bicyclists, and street vendors, aligning with existing literature advocating for well-designed sidewalks to cater to diverse user needs.

The issue of congested and uncomfortable vehicular traffic is evident, with on-street parking, road encroachment, and poorly maintained roads contributing to prolonged travel times and operational difficulties for drivers. Survey results and key informant interviews emphasize the adverse effects of congestion on both vehicular and pedestrian experiences.

Unplanned and incompatible land use, characterized by commercial activities spilling into pedestrian spaces, presents a hazardous environment. Survey responses highlight residents' feelings of unsafety due to the lack of dedicated pedestrian space, emphasizing the need to address commercial encroachment.

The survey results regarding the consequences of streetscape challenges on the livability and quality of life for residents underscore the interconnected nature of these issues. Pedestrian safety and comfort, traffic congestion and accidents, limited physical activity, limited accessibility and mobility, lack of green spaces, limited community interaction, and noise and air pollution emerge as significant concerns.

These findings align with existing literature, emphasizing the critical role of well-designed urban environments in fostering accessibility, safety, physical activity, community interaction, and environmental quality. The study not only provides valuable insights into the specific challenges faced by the Dukem Sub-city community but also serves as a call to action for urban planners and policymakers to implement targeted interventions for a more livable and sustainable urban environment. The intricate interplay between streetscape challenges and the diverse aspects of urban life underscores the importance of a holistic and integrated approach to urban planning and design.

5.2. Recommendation

In response to the identified challenges and deficiencies in the streetscape of Dukem Sub-city stretch from Addis Kera Asphalt Road up to East Industry Zone Street, a comprehensive and strategic intervention plan is crucial to enhance the livability, safety, and overall user experience of the area. The following recommendations outline a holistic urban revitalization strategy:

1. Pedestrian Infrastructure Enhancement:

- Install shade trees along sidewalks to provide relief from the sun, promoting pedestrian comfort.
- Address obstacles and encroachments on sidewalks to ensure a smooth and safe passage for pedestrians, especially those with disabilities.
- Introduce pedestrian-friendly features such as benches, crosswalks, and designated pedestrian zones to enhance the overall pedestrian experience.

2. Lighting Improvement:

- Upgrade and increase the number of street lights to improve both actual safety and the perceived fear of crime.
- Conduct a thorough assessment of lighting needs and preferences, considering community input to ensure nuanced and effective interventions.

3. Street Vending Management:

- Develop designated areas for street vending to minimize congestion on sidewalks and ensure the safety and convenience of both pedestrians and vendors.
- Implement regulations and guidelines for street vending to strike a balance between economic activities and pedestrian movement.

4. Traffic Management and Road Maintenance:

- Implement efficient traffic flow measures, including defined lanes, clear junction signage, and dedicated areas for service vehicles.
- Address on-street parking issues by creating formal parking spaces, preventing cars from encroaching on sidewalks and impeding pedestrian flow.
- Initiate road maintenance programs to enhance the quality and safety of road infrastructure.

5. Inclusive Urban Design:

- Develop and enforce urban design guidelines that prioritize inclusivity, catering to the needs of diverse users, including the elderly, disabled individuals, bicyclists, and street vendors.

- Promote mixed-use development with well-defined boundaries between commercial activities and pedestrian spaces.

6. Community Engagement and Education:

- Engage the local community in the urban revitalization process through workshops, town hall meetings, and surveys to gather input and preferences.
- Conduct public awareness campaigns to educate residents, businesses, and drivers about the importance of adhering to urban guidelines for a safer and more livable community.

7. Green Space Integration:

- Introduce greenery, street trees, and public spaces to improve the aesthetic appeal and environmental quality of the streetscape.
- Encourage the creation of pocket parks, communal gardens, and recreational spaces to foster community interaction and physical activity.

8. Land Use Planning:

- Develop and implement strategic land use plans that balance commercial, residential, and recreational spaces to create a more diverse and functional urban environment.
- Preserve historical character by introducing incentives for the adaptive reuse of traditional structures and the incorporation of traditional elements in new developments.

9. Transportation Infrastructure Enhancement:

- Improve public transportation options by introducing designated bus stops, shelters, and dedicated lanes for public transport.
- Implement bike-friendly infrastructure to promote sustainable transportation and reduce reliance on private vehicles.

10. Monitoring and Evaluation:

- Establish a monitoring and evaluation framework to assess the impact of implemented interventions.
- Regularly collect feedback from residents, businesses, and other stakeholders to make informed adjustments to the revitalization strategy.

These recommendations, when implemented collaboratively by urban planners, policymakers, and community stakeholders, have the potential to transform the current streetscape challenges in Dukem

Sub-city stretching from Addis Kera Asphalt Road up to East Industry Zone Street into a vibrant, sustainable, and inclusive urban space that caters to the diverse needs of its residents and visitors.

5.2.1. Inclusive Street Design Recommendation

Based on the findings of the research and discussion, the study recommend a comprehensive design for the 40-meter-wide street in Dukem Sub-city stretching from Addis Kera Asphalt Road up to East Industry Zone Street that prioritizes pedestrian-friendliness, inclusivity, and efficient traffic flow. This design considers the existing structural plan and adapts to different land uses within the area.

Design strategies

Dukem Sub-city has the potential to transform into a vibrant and livable space, and urban design principles can be the driving force behind this transformation. By implementing the following design strategies, Dukem can address the needs identified in the findings, enhance the existing streetscape, and ultimately improve the quality of life for its residents and visitors.-



LANDSCAPE AND VIEW

Green dominant ecological and water sensitive sidewalks allow a better spatial experience while providing service and visually attractive streets



ACCESSIBILITY

Wider and active walkways to avoid and decrease physical contact and smooth the high density of pedestrian flow additional transport options for better mobility



PLACE OF DESTINATION AND INTERACTION

Making space comfortable and safe by using different streetscape elements which create desire on people to live and visit the street and make attraction space

Streetscape furniture as a friendly gesture that attracts the pedestrian

Design programs

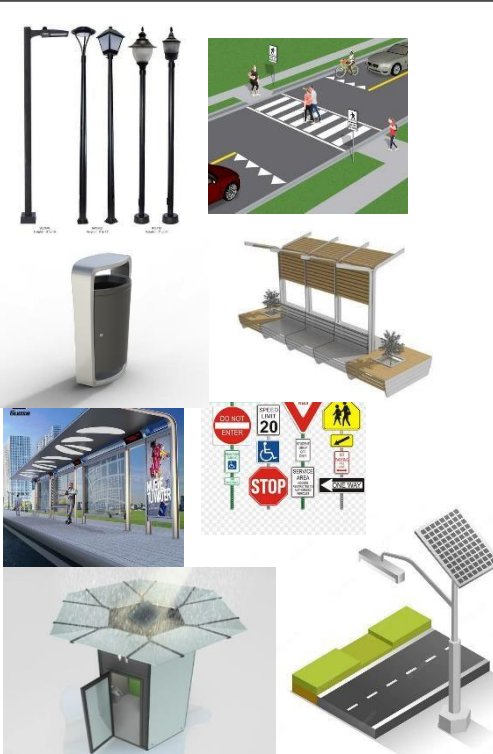
Table 13 Design programs

No	Programs	Size in meter (m)

1	8 *3 vehicular transit lane	24
2	Building frontage zone	1.5 (each side)
3	Pedestrian clear zone	2.5 (each side)
4	Land scape and furniture zone	2 (each side)
5	Bike lane	1.5 (each side)
6	Median	2
7	Buffer	0.5 (each side)
8	Flex zone	2.5 (specific areas)
	Total	42 m

Streetscape elements

Table 14 Basic streetscape elements suggested on the site

• Street lights, • Trash cans • Sinage • Public toilets • Traffic signs and signals, • Street trees and other horticultural elements, • General public furniture, • Advertising signs, and decorations • Bicycle facilities(bikeway, rackes) • Waiting areas • Marked crosswalks • Special paving's	
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Proposed Design (Prototype)

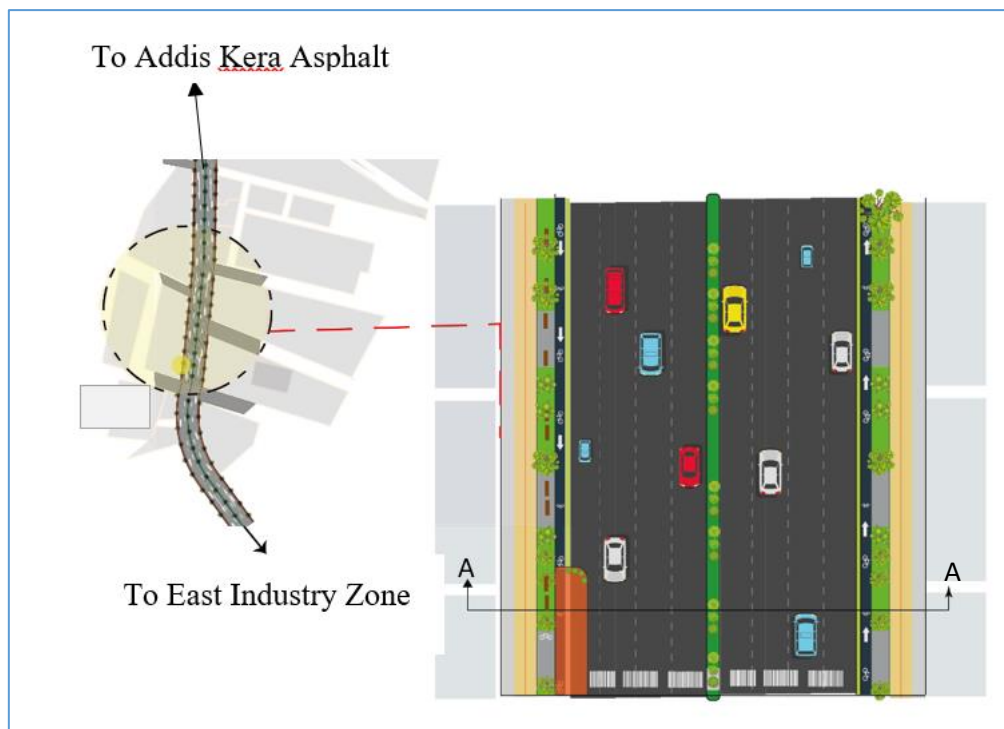


Figure 23: Plan of the Street

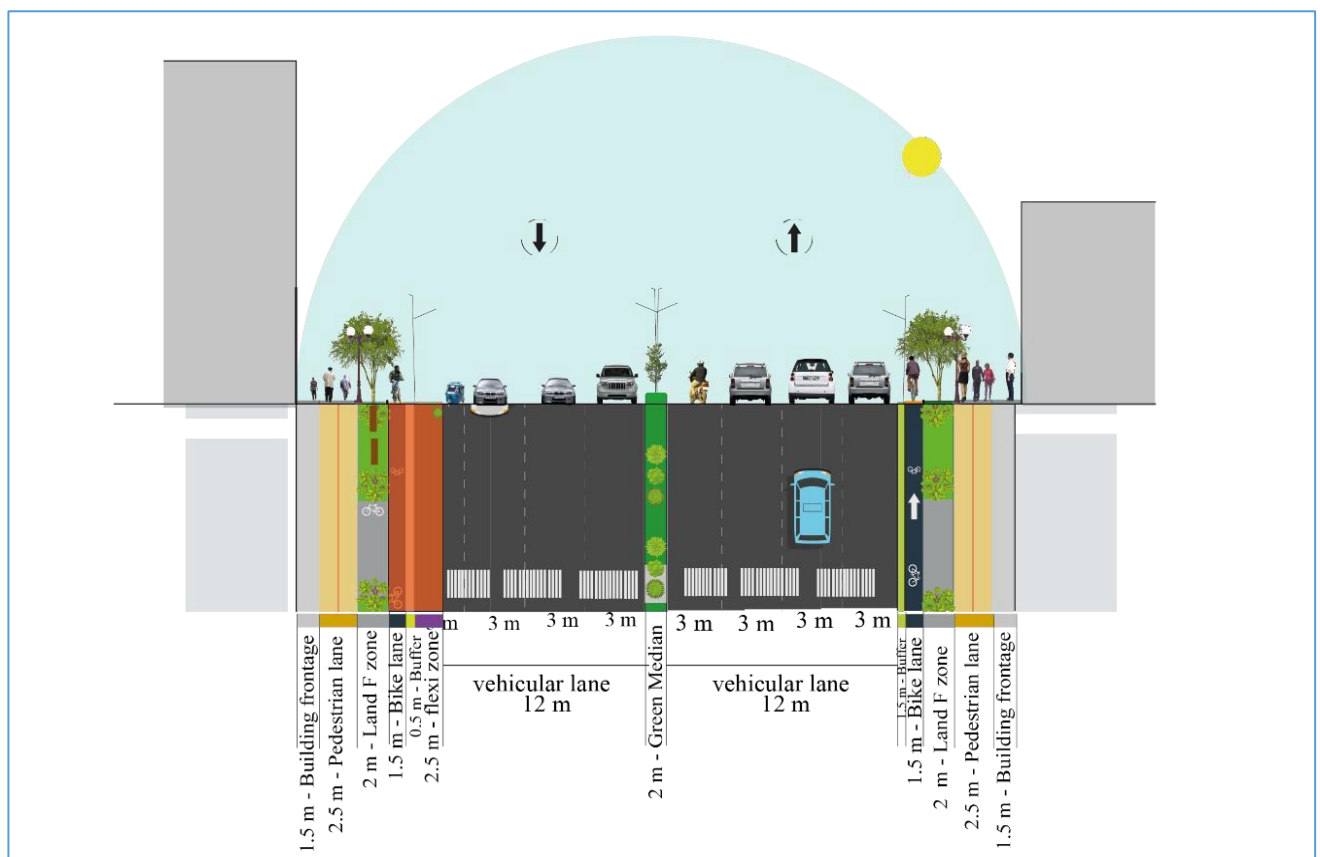


Figure 24: Street Section A-A

REFERENCES

1. Appleyard, D. (1979). The environmental quality of urban streets: The effects of density, land use, and design. New York: Plenum Press.
2. Beatley, T. (2011). How to urbanize: a handbook for small and medium-sized cities. Island Press
3. Bai, X. (2010). Urban sustainability and the yardstick of urban liveability. *China Planning Review*, 26(1), 1-28.
4. Gehl, J. (2010). Cities for people. Island Press.
5. Agyemang, I. (2013). Sustainable communities and the social dimension of sustainability. New York: Routledge.
6. Koffi, B. A., Bakenberg, A. C., & Kruger, E. (2019). Walking in African cities: A review of the literature on pedestrian safety and walkability. *Journal of Transport & Health*, 12, 100108.
7. Satterthwaite, D. (2008). The politics of urban poverty and human rights: Gully dwellers in Mumbai. *Environment & Urbanization*, 20(1), 7-23.
8. UN-Habitat. (2016). State of the world's cities 2016: Urban resilience and inclusive growth. Nairobi, Kenya: UN-Habitat.
9. World Health Organization. (2018). Global status report on road safety 2018. Geneva, Switzerland: World Health Organization.
10. Newman, P., & Kenworthy, J. (1989). Cities and automobile dependence: An international study. Gower.
11. Ma, X., Ma, C., Wu, C., Xi, Y., Yang, R., Peng, N., ... & Ren, F. (2021). Measuring human perceptions of streetscapes to better inform urban renewal: A perspective of scene semantic parsing. *Cities*, 110, 103086.
12. Lu, Y. (2019). Using Google Street View to investigate the association between street greenery and physical activity. *Landscape and Urban Planning*, 191, 103435.
13. World Health Organization. (2016). Global action plan on physical activity and health. World Health Organization.

14. Montgomery, M. R., Stren, R., Cohen, B., & Reed, H. E. (2013). *Cities transformed: demographic change and its implications in the developing world*. Routledge.
15. European Commission. (2015). Green Infrastructure (GI) – Enhancing Europe’s Natural Capital. Retrieved from https://ec.europa.eu/environment/nature/ecosystems/docs/green_infrastructure_leaflet.pdf
16. Lydon, M., & Garcia, A. (2015). *Tactical Urbanism: Short-term Action for Long-term Change*. Island Press. National Complete Streets Coalition. (2021). What are Complete Streets? Retrieved from <https://smartgrowthamerica.org/program/national-complete-streets-coalition/>
17. Vision Zero Network. (2021). What is Vision Zero? Retrieved from <https://visionzeronetwork.org/about/what-is-vision-zero/>
18. Ibrahim, D. M. F. O. (2023). Enhancing the Streetscape of Sidewalks for Sustainability and Liveability in Shared Streets. *Green Building & Construction Economics*, 225-240.
19. Istrate, A. L., & Chen, F. (2022). Liveable streets in Shanghai: Definition, characteristics and design. *Progress in Planning*, 158, 100544.
20. MOHAMMAD, S., & Hatipoğlu, H. K. (2023). Rethinking the Role of the Street: A Framework for Developing Liveable Streets in Urban Fabric of Turkey. *A+ Arch Design International Journal of Architecture and Design*, 8(2), 129-140.
21. Nuriye, G. (2014). Ethiopian practices in urban-urban and urban-rural linkages from road transportation perspectives in Hawassa City, Ethiopia. *Journal of Economics and Sustainable Development*, 5(27), 227-235.
22. Teklemariam, E. A., & Shen, Z. (2020). Determining transit nodes for potential transit-oriented development: Along the LRT corridor in Addis Ababa, Ethiopia. *Frontiers of Architectural Research*, 9(3), 606-622.
23. Assen, S. M., & Quezon, E. T. (2019). Model-based urban road network performance measurement using travel time reliability: A Case Study of Addis Ababa City, Ethiopia. *American Journal of Civil Engineering and Architecture*, 7(5), 202-207.
24. Atsbeha, T. E., Zhongwei, S. H. E. N., & Wubengda Haile, T. S. E. G. A. Y. E. (2017). Reviving the Historic Street through Pedestriansation: In the Case of Haileselassie Street, Piazza, Addis Ababa. *Journal of Landscape Research*, 9(5).

25. Hagos, K. G., & Adnan, M. (2020). Effect of sidewalk vendors on pedestrian movement characteristics: A microscopic simulation study of Addis Ababa, Ethiopia. *Cities*, 103, 102769.
26. Streets, B. C. (2013). Boston Complete Streets: design guidelines. Boston. Recuperado de< http://bostoncompletestreets.org/pdf/2013/BCS_Guidelines.pdf>. Acesso em, 10(02), 2018.
27. Schlebusch, S., & Cilliers, E. J. (2013). Planning for sustainable communities: Layout and design approaches. Potchefstroom, South Africa: North-West University.
28. Byrne, J., & Sipe, N. (2010). Green and open space planning for urban consolidation—A review of the literature and best practice. *Urban Research Program*, 11, 60.
29. Frank, L. (2010). *Streetscape design: perceptions of good design and determinants of social interaction* (Master's thesis, University of Waterloo).
30. El-Shimy, H. G., & Ragheb, R. A. (2017). Sustainable urban street design: evaluation of el-moaz street in Cairo, Egypt. *Procedia Environmental Sciences*, 37, 689-698.
31. Picone, N., Esposito, A., Emmanuel, R., & Buccolieri, R. (2023). Potential Impacts of Green Infrastructure on NOx and PM10 in Different Local Climate Zones of Brindisi, Italy. *Sustainability*, 16(1), 229.
32. Gehl, J., Svarre, B., Gehl, J., & Svarre, B. (2013). Public space, public life: an interaction. *How to study public life*, 1-8.